

# THE ORB-WEAVER GENERA *VERRUCOSA*, *ACANTHEPEIRA*, *WAGNERIANA*, *ACACESIA*, *WIXIA*, *SCOLODERUS* AND *ALPAIDA* NORTH OF MEXICO (ARANEAE: ARANEIDAE)

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**ABSTRACT.** North of Mexico are found one species each of *Verrucosa*, *Wagneriana*, *Acacesia*, *Scoloderus* and *Alpaida*, four species of *Acanthepeira*, of which two are new, and three of *Wixia*, of which one is new. Most species of these genera, except *Acanthepeira*, are tropical American; the Nearctic species are found in the eastern half of the United States, except that *Wixia globosa* is found in the Southwest. Morphological intermediates of the *Acanthepeira* species are found. Among these genera, diversity of habits and web structure is much greater than would be expected from studies based on groups with mainly temperate distributions.

## INTRODUCTION

Most orb-weavers are tropical and information about the few well-known north temperate orb-weavers has been generalized erroneously. Lack of information on tropical species has permitted arachnologists to study web structure only superficially, and there is as much diversity in habits and behavior as there is in web structure. The tropical orb-weavers tantalize with their promise of exciting behavioral adaptations to be discovered once we know the species.

Not only do orb-webs differ in structure, but, more importantly, they differ in when and how they are used. Most species do not share the well-known habits of *Araneus diadematus* (Witt, *et al.*, 1968): making a web early in the morning just before daylight, keeping the orb up a day, tearing

down all but the frame lines during the night. *Araneus* species are generally nocturnal, but leave their webs up during the day. *Acacesia hamata* makes its fine-meshed, previously unknown, web at dusk, and hauls it in at daybreak, only to make a new web in a different place the following evening (Plate 5). *Verrucosa arenata* makes a large, loose web low in trees each morning or evening and removes it after sunrise; this species rests head up in its web (Plates 1, 2), the reverse of the usual orb-weaver resting position. The *Scoloderus* web is a long ribbon (Plate 6) with the hub at one end. As it has only recently been found, we may suppose it is a nocturnal web. Other orb-weavers in the tropics pull their webs in only a few hours after completing them (W. Eberhard, personal communication). In Panama I observed a large *Eriophora* sp. female, closely related to the group treated here, making a huge web, about 60 cm diameter, after dark every night. By morning the web had disappeared, and a new one was made the following evening after dark. Not even frame threads were left during the day and the spider itself disappeared. While *Verrucosa arenata* makes a flimsy retreat on a leaf (Plate 1), *Acacesia hamata* makes no retreat at all but depends on its coloration to make it disappear among foliage (Plate 5). *Wixia* is believed to make its web high in trees, and the spider probably rests

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Plate 1. *Verrucosa arenata*. Above: web. Below: female in retreat and two males sparring. (Photographs by A. Moreton and J. Carico.)



Plate 2. *Verrucosa arenata* in web facing up. (Photograph by A. Moreton.)

tightly appressed to a twig rather than in a silky retreat.

Aside from the observations reported here, almost nothing is known about feeding habits. An old observation recently republished (Forster and Forster, 1973) that *Celaenia* catches only male moths suggests the use of pheromones to attract prey.

While nocturnal orb-weaving spiders are brown in color with disruptive patterns that make them difficult to find during daytime (Plate 5), diurnal orb-weavers, which hang during the day in the middle of the web, are brightly colored, often silvery (*Argiope*, *Leucauge*, *Tetragnatha*, *Nephila*). Perhaps the silver reflects light and heat, or makes them hard to see in meadows among plants (*Argiope*, Levi, 1969). Other diurnal orb-weavers have spines on the abdomen (*Gasteracantha*,

*Micrathena*), perhaps obscuring their outlines. The white zigzag stabilimentum, which appears only in the webs of diurnal orb-weavers, is the subject of a controversy regarding its origin and function. While many orb-weavers take their webs down in pouring rain, *Cyrtophora* and perhaps also *Mecynogea* keep theirs up. Although their webs are inefficient for catching insects, and energy-consuming to construct, they alone take advantage of the insect abundance following a tropical downpour (Y. Lubin, 1973, 1974).

Sometimes it is surprisingly easy to sort spider specimens into populations that represent species by using a combination of morphological characters, but, as this study progressed, difficulties presented themselves. In *Acanthepeira*, some specimens do not fit, and the species appear to hybridize. The species differ not only in the structure of the epigynum but also in the shape of the abdomen, the size, and the armature of the fourth coxa and leg in males. I can only make students of spiders aware of this species problem to which laboratory study yields no solution. Only field work in the southeastern states can resolve the problem of the various intermediates between *Acanthepeira* species.

The species included in this paper all are related to *Eriophora* (Levi, 1970), and, more distantly, to *Araneus* (Levi, 1971, 1973). All are Neartic representatives of tropical American genera, except that members of *Acanthepeira*, though related to the tropical orb-weavers described here, are found north of Mexico.

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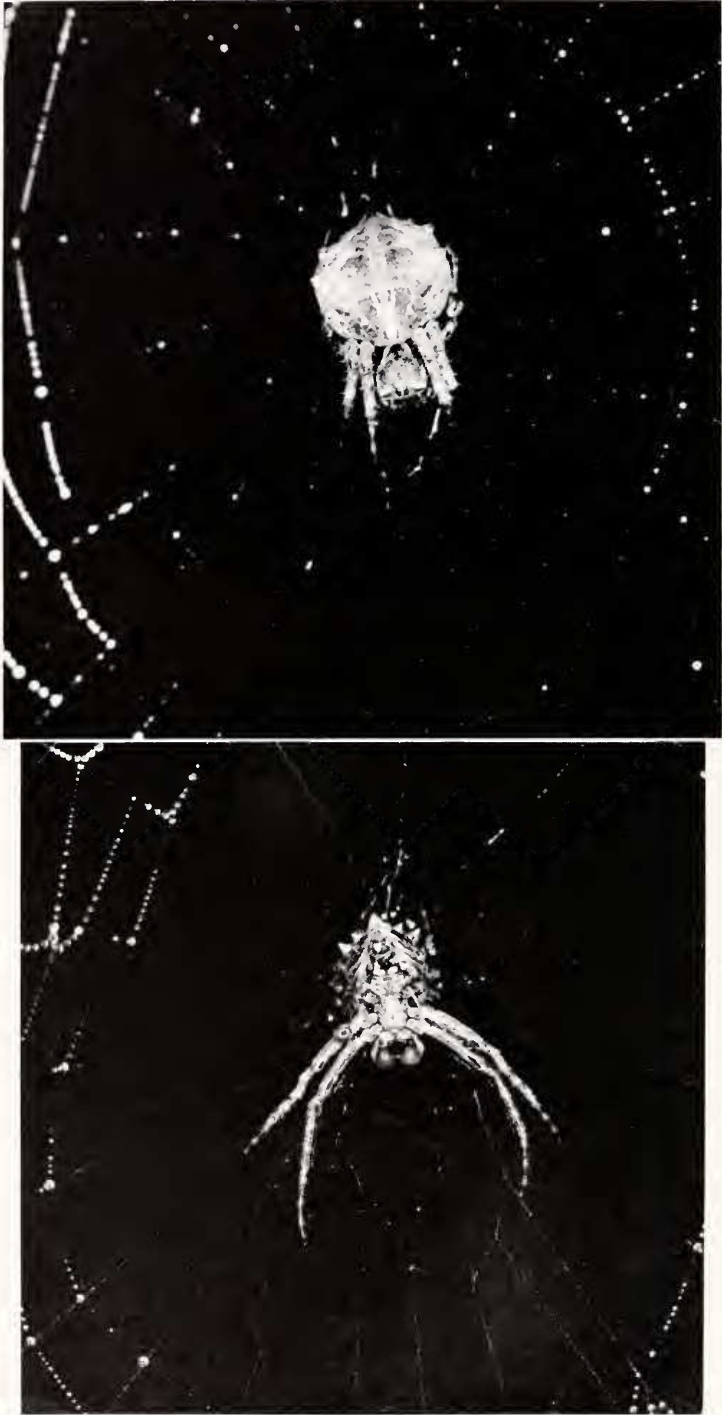


Plate 3. *Acanthepeira stellata* in web. Above: female. Below: juvenile male. (Photographs by A. Moreton.)



Plate 4. *Acanthepeira venusta* female.

Moss and D. G. Rentz, Academy of Natural Sciences of Philadelphia; R. Matthews; W. B. Peck; N. I. Platnick, American Museum of Natural History and Cornell University Collections; S. Riechert; V. D. Roth; R. Schick, California Academy of Sciences; W. Sedgwick; K. J. Stone; H. K. Wallace; F. R. Wanless, British Museum, Natural History; H. V. Weems, Florida State Collection of Arthropods. The study and its publication were supported in part by the National Sciences Foundation grant GB-36161. L. R. Levi reconstructed my faltering syntax.

### *Verrucosa* McCook

*Verrucosa* McCook, 1888, Proc. Acad. Natur. Sci. Philadelphia, p. 78. Type species *Epeira arenata* Walckenaer (= *E. verrucosa* Hentz) by tautonymy and monotypy [*Verrucosa* original misspelling]. The name is feminine.  
*Mahadiva* Keyserling, in O. P.-Cambridge, 1889, Biologia Centrali-Americana, Araneidea, 1: 53.  
*Mahadeva* Marx, 1890, Proc. U. S. Natl. Mus., 12: 541. Type species *Epeira verrucosa* Hentz by monotypy.

*Note.* O. P.-Cambridge and also Marx attribute the name to Keyserling, 1892, Spinnen Amerikas, 4: 67. In Keyserling *Mahadeva* is spelled with an e.

*Diagnosis.* *Verrucosa* females differ from those of other genera by having the abdomen as wide as long, or wider than long, with tubercles at the posterior end and a dorsal, white, glossy mark (Fig. 1). Males differ from those of other genera by having, on the second left tibia, a branch bearing two short macrosetae (Fig. 7). The palpus differs from that of male *Paravixia* in having the paramedian apophysis fused to the proximal end of the long conductor (Fig. 9). The females, unlike those of other Araneidae, rest in the web head up (Plate 2).

*Genitalia.* The base of the epigynum bears an annulate scape, very long in *V. arenata* (Fig. 3), in *V. undecimvariolata* the length equal to the width of the base. In *Verrucosa* alone among related genera, a pair of lateral lamellae enclose the base of the epigynum, small in *V. arenata* (Fig. 4), very large in *V. undecimvariolata*.

In the palpus of *Verrucosa* males alone, the paramedian apophysis is fused to the proximal end of the long, narrow conductor, giving a hint as to the origin of this sclerite found in the palpi of only these related genera. The base of the embolus, called the stipes when a separate sclerite, has distal hematodocha and bears a terminal apophysis with a long distal spine (Figs. 9, 10). The embolus has a lamella, narrow, pointed, and running parallel to it in *V. arenata* (Figs. 8, 11), wide in *V. undecimvariolata*. In addition, the embolus of *V. undecimvariolata* has a mitten-shaped shield toward the mesal side. The median apophysis in both species is long and narrow, parallel to the narrow conductor, and has a hook-shaped basal extension opposed to the paramedian apophysis.

*Coloration.* The carapace, sternum, and coxae are light to dark brown with paired darker gray patches on carapace. Legs brown and banded, with proximal ends of some articles lighter. Dorsum of the female abdomen blackish with a white triangle pointing posteriorly (Fig. 1). Venter of abdomen black in *V. arenata* with paired

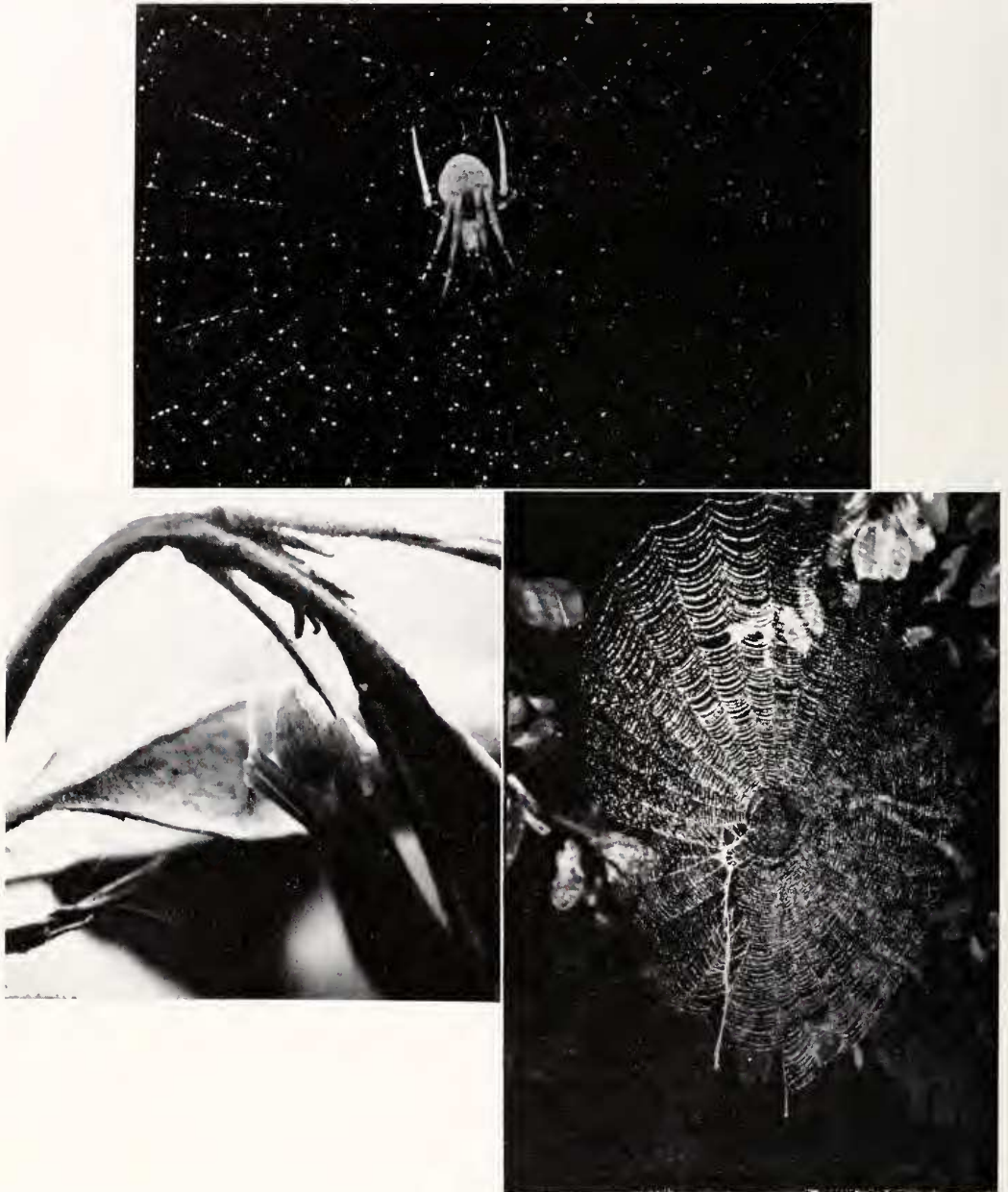
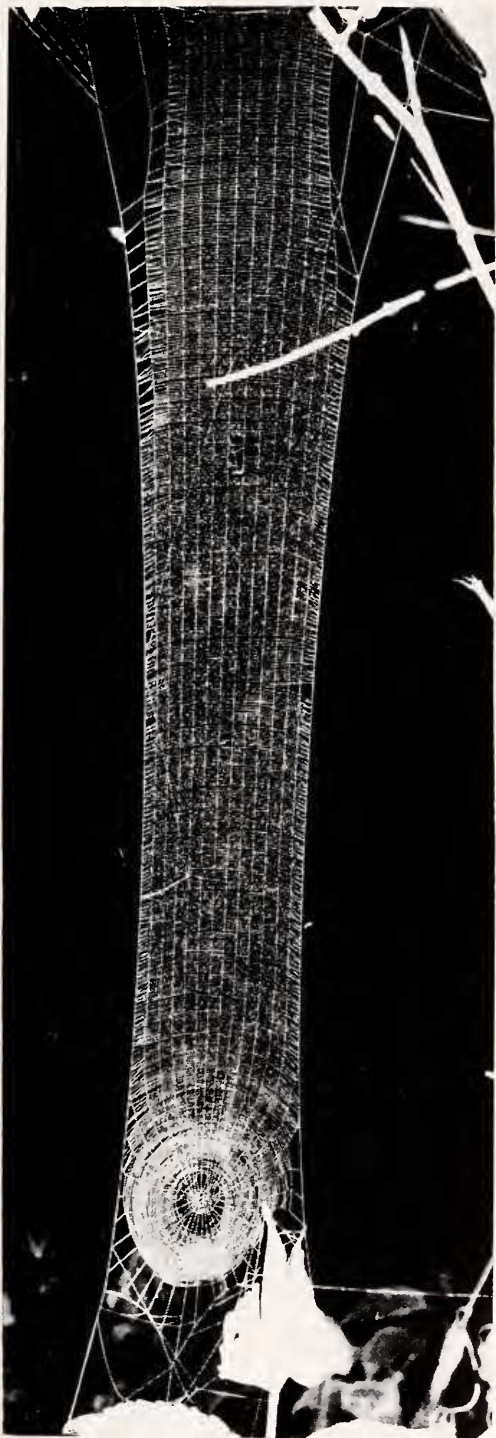


Plate 5. *Acacesia hamata*. Top: female in web. Left: female on vegetation. Right: web. (Top and right photographs by J. Carico.)

white spots (Fig. 2), or with a central white spot in *V. undecimvariolata*. The male abdomen has only indistinct marks (Fig. 6).

*Structure.* The eye area of the female is wide in front, the laterals far from medians (Fig. 1). The height of the clypeus equals the diameter of the anterior median eyes.

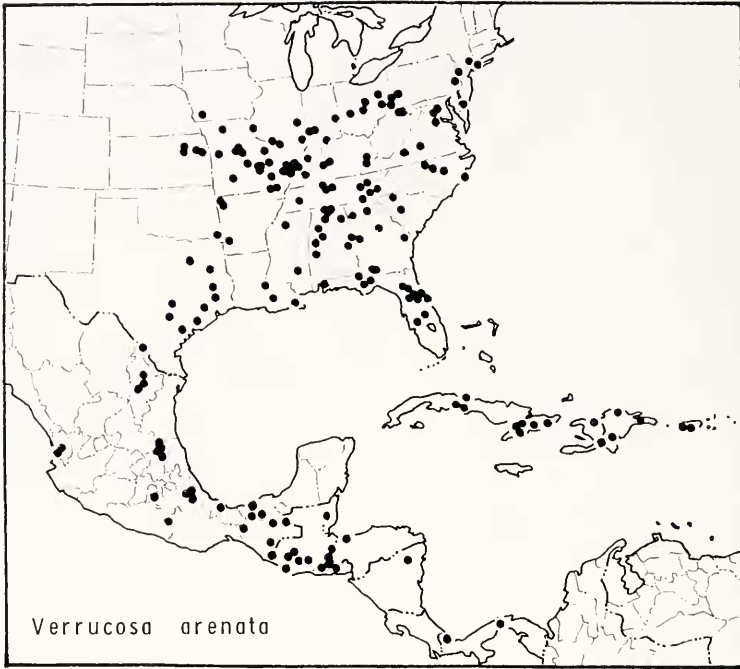


The swollen head area is delimited anteriorly by a shallow groove between the posterior median and posterior lateral eyes, and posteriorly by a deeper diagonal groove toward the thoracic area (Fig. 1). There are dark patches in the grooves and no thoracic depression in the female. The male carapace is narrower in the eye region, lacks the grooves between median and lateral eyes and has a shallow thoracic depression traversed by a longitudinal line (Fig. 6). The anterior median eyes are the largest, the laterals smallest. The anterior median eyes are slightly more than their diameter apart and the posterior medians about their diameter apart. The female abdomen is somewhat sclerotized, subtriangular, wide in front, pointed behind with lateral humps and tubercles along the posterior and sides (Fig. 1). The abdomen of the smaller male is longer than wide, with indistinct lateral and posterior tubercles, and some dark, dorsal sclerotized disks (Fig. 6). The palpal femur has a basal tooth facing that of the endite. The palpal patella has only one seta. The first coxa has a hook fitting into a depression of the second femur, and the swollen second tibia has a long spur bearing two macrosetae, and a shorter spur bearing one (Fig. 7). The males have relatively longer legs than the females. The first, second and fourth femora of the males have a single row of macrosetae on the venter, the first and second femora of the females a double row, and the tarsi lack large setae in both sexes.

*Species.* *Verrucosa* are all American. Only one species, *V. arenata*, occurs north of Mexico, and its range extends into Central America (Map 1). In southern Mexico and Central America the sympatric *V. undecimvariolata* is smaller in size, has a wider abdomen, a central, ventral white spot, and differs in details of the genitalia. A third species is *V. meridionalis* (Keyser-

←

Plate 6. *Scoloderus tuberculifer* web. (Photograph taken in Colombia by W. Eberhard.)



Map 1. Distribution of *Verrucosa arenata* (Walckenaer).

ling) of southern Brazil, with a relatively narrow abdomen, and the scape of the epigynum wider than that of *V. undecimvariolata*.

*Misplaced species.*

*Epeira alticeps* Keyserling, 1879 is an *Alpaida*. NEW COMBINATION.

*Epeira audax* Blackwall, 1863, belongs to *Parawixia*. It is found in Brazil. Specimens of the Marx collection were mislabeled as coming from North America.

*Verrucosa rubronigra* Mello-Leitão, 1939 is a juvenile *Alpaida*. NEW COMBINATION. The female has recently been redescribed under the name *Acrosoma riscoi* Archer, 1971. NEW SYNONYMY.

*Verrucosa arenata* (Walckenaer)

Map 1, Figures 1–11, Plates 1, 2

*Epeira mexicana* Lucas, 1833, Mag. Zool. Guérin, classe 8, pt. 1, pl. 3, ♀. Female specimens from Mexico and Guatemala, lost. NEW SYNONYMY, NOMEN OBLITUM.

*Epeira arenata* Walckenaer, 1841, Histoire Naturelle des Insectes, Aptères, 2: 133, ♀. Female syntypes, Abbot manuscript illustration p. 16,

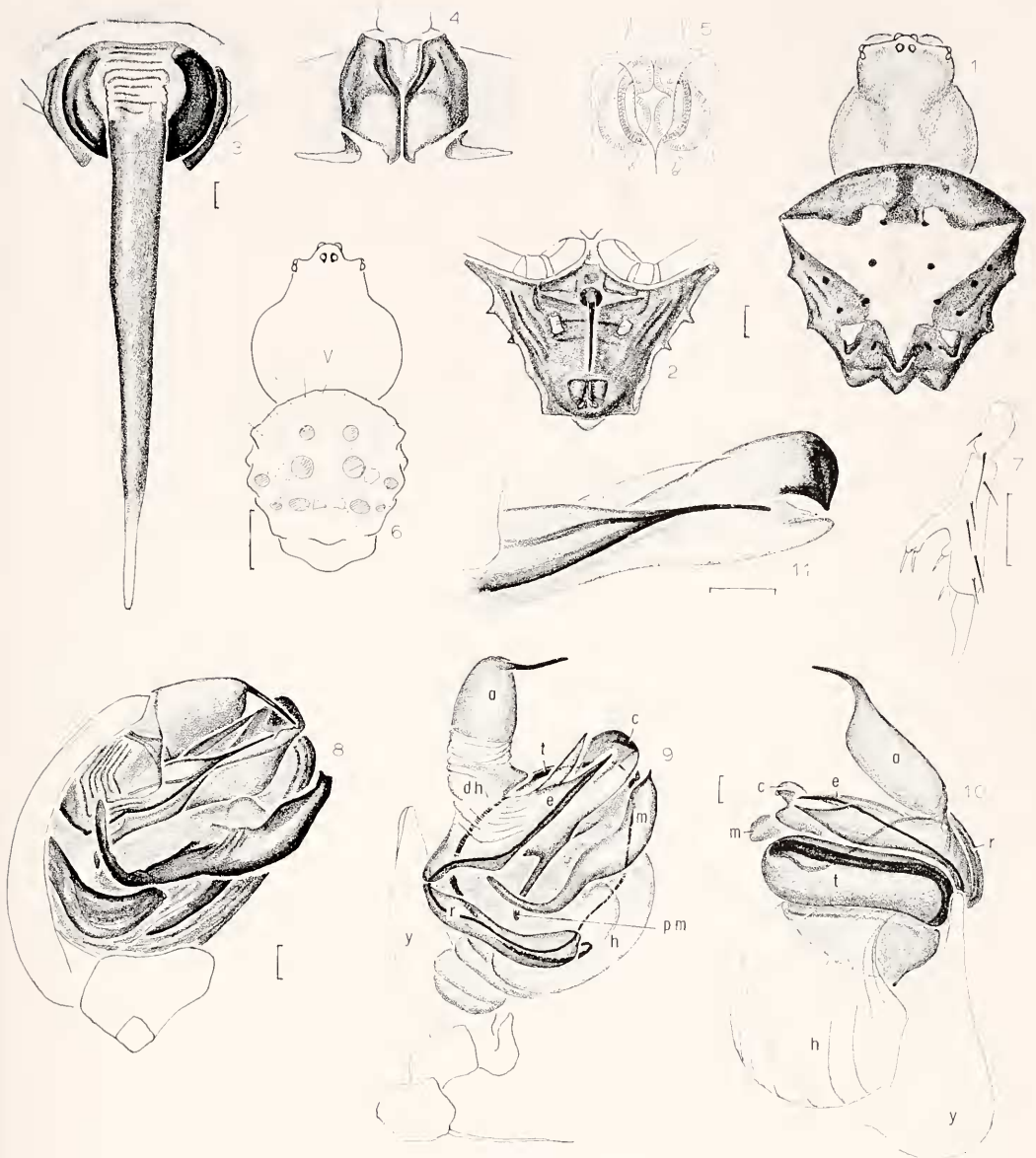
fig. 165, p. 17, figs. 181–183, ♀; male, p. 29, fig. 360, from Georgia in the British Museum, Natural History. Copy in the Museum of Comparative Zoology, examined.

*Epeira verrucosa* Hentz, 1850, J. Boston Soc. Natur. Hist., 6: 19, pl. 3, fig. 2, ♀. Female syntypes from North Carolina and Alabama in the Boston Society of Natural History, destroyed. Emerton, 1902, Common Spiders, p. 181, figs. 421–423, ♀, ♂.

*Verrucosa arenata*, – McCook, 1888, Proc. Acad. Nat. Sci., Philadelphia, p. 78. 1893, American Spiders 3: 200, pl. 12, figs. 6, 7, ♀, ♂. F. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 482, pl. 45, figs. 23, 24, ♀, ♂. Comstock, 1912, Spider Book, p. 465, fig. 480, ♀. Petrunkevitch, 1930, Trans. Connecticut Acad. Sci., 30: 329, figs. 211, 212. Comstock, 1940, Spider Book, rev. ed., p. 479, fig. 480, ♀. Roewer, 1942, Katalog der Araneae, 1: 879. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 229, figs. 735–736, ♀. Bonnet, 1959, Bibliographia Araneorum, 2(5): 4789.

*Mahadiva reticulata* O. P.-Cambridge, 1889, Biologia Centrali-Americana, Araneidea, 1: 54, pl. 3, fig. 10, ♂. Male type from Volcan de Chiriquí, Panama in the British Museum, Natural History, not examined. Keyserling, 1892, Spinnen Amerikas, 4: 71, pl. 3, fig. 55, ♂.





Figures 1-11. *Verrucosa arenata* (Walckenaer). 1. Female, dorsal. 2. Female, venter of abdomen. 3-5. Epigynum. 3. Ventral. 4. Posterior. 5. Posterior, cleared. 6. Male, dorsal. 7. Second tibia of male, anterior view. 8-11. Left palpus. 8. Mesal view. 9. Expanded, subventral. 10. Expanded, subdorsal view. 11. Embolus and conductor. **Abbreviations.** a, terminal apophysis; c, conductor; dh, distal hematodocha; e, embolus; h, basal hematodocha; m, median apophysis; pm, paramedian apophysis; r, radix; t, tegulum; y, cymbium. **Scale lines.** 0.1 mm, except Figs. 1, 2, 6, 1.0 mm.

*Mahadeva* [sic] *verrucosa*, - Keyserling, 1892, *Spinnen Amerikas*, 4: 72, pl. 3, fig. 56, ♀, ♂.  
*Araneus aequiangulus* Franganillo, 1930, *Inst. Nac. Invest. Cienc. Habana*, 1: 70, fig. 9, ♀. Female

type in the Cuban Academy of Science, Havana in unlabeled vials. Franganillo, 1936, *Aracnidos de Cuba*, p. 69. **NEW SYNONYMY.** *Araneus aequiangulus*, var. *ochraceus* Franganillo,

1930, Inst. Nac. Invest. Cienc. Habana, 1: 72. Female type in the Cuban Academy of Science, Havana in unlabeled vials. Franganillo, 1936, *Aracnidos de Cuba*, p. 70. NEW SYNONYMY.

*Note.* The illustration and description of Lucas' leave little doubt that his *Epeira mexicana* is an older name for this common species. As the name *arenata* has been used many more than ten times during the last 100 years, I consider *mexicana* a nomen oblitum. Furthermore, the name *Verrucosa mexicana* has been used for the Central American *Verrucosa undecimvariolata*, an erroneous nineteenth century synonymy of Simon.

*Description* of female from Tennessee. The abdomen has no setae but some sclerotized spots on sides. Total length, 8 mm. Carapace 3.5 mm long, 3.0 wide. First femur, 4.9 mm; patella and tibia, 5.0; metatarsus, 3.6; tarsus, 1.3. Second patella and tibia, 4.0 mm; third, 2.2; fourth, 3.5.

Male. Total length, 5.5 mm. Carapace 2.5 mm long, 2.2 wide. First femur, 4.5 mm; patella and tibia, 4.7; metatarsus, 4.0; tarsus, 1.1. Second patella and tibia, 2.9 mm; third, 1.6; fourth, 2.2.

*Variation.* *Verrucosa* females may be yellow or white. Females north of Mexico vary from 5.0 to 9.5 mm total length, carapace 2.3 to 3.7 long, 2.2 to 3.5 wide. Males north of Mexico vary from 4.0 to 6.1 mm total length, carapace 2.2 to 3.0 long, 1.9 to 2.5 wide. Individuals from each collection are about the same size, the smallest specimens coming from the Gulf states, the largest from southern Mexico and Central America, where the species competes with the smaller *V. undecimvariolata*. A female from the Panama Canal Zone measured 11.9 mm total length, carapace 5.2 long, 4.2 wide.

*Diagnosis.* Females have the scape reaching almost to the spinnerets and there is a small white spot on each side of the scape in the black area (Fig. 2). In the Central American *V. undecimvariolata* the venter has a large central white spot and a very short scape, covering less than half the

distance from epigynum to spinnerets. In the male of *V. arenata* the palpal embolus tapers evenly to the tip (Figs. 8, 11); that of *V. undecimvariolata* has an upper lobe, and the subterminal apophysis (?) near the base of the embolus is more sclerotized.

*Natural History.* Males are mature in August and September in the northern part of their range, females from early August to October. This species is commonly found in woods, but also in gardens. The female makes a retreat in a broad leaf, usually on the upper side, by bending the leaf along its long axis and fastening it with strands of silk (Plate 1). The retreat is made on a low, overhanging branch of a tree that faces an open area such as a yard or field. The vertical web is triangular with the upper strand slightly off the horizontal to 45°. The retreat is always at the highest point of the web. Spirals range from 20 to 32 complete turns, average about 25. There are about 19–22 radii. Area of web incorporating the spirals measures about 60 × 90 cm (Plate 1). The web is usually made in the early morning, from midnight until about 3:00 h, and is removed shortly after sunrise. This timing varies widely, and is often disrupted by weather conditions such as rain, strong winds, etc. Webs are not made every morning, especially with older females (unpublished observations of ten females near Lynchburg, Virginia by Robert McMichael, Glen Rubis and J. E. Carico). Ms. A. Moreton (in letter) reported that a female near Powhatan, Virginia built a web in the early evening between 19:00 and 22:00 h and took the web down between 9:00 and 10:00 h in the morning. One male was found about 4 cm from the retreat of the female. Another male crawled up the upper foundation thread toward the retreat, periodically giving a series of 4 to 5 jerks on the thread. The female, resting in the hub during this time, responded each time with 4 to 5 jerks. When the second male reached the vicinity of the retreat, the males exchanged jerks, approached each other, and combat oc-

curred (by this time, the female had moved to her retreat), resulting in eviction of the first male (Plate 1). The second male began wandering soon thereafter, fed upon some of the coarser parts of a lower foundation thread, and left the vicinity. This observation was made at approximately 7:30 h, 14 September 1974. The female removed her web at 9:10 h (Robert McMichael, Glen Rubis, and J. E. Carico, in letter). The female rests in the web with the head up (Plate 2).

*Distribution.* Eastern states, from southern New York state to Iowa and north-eastern Kansas, south to Panama; West Indies (Map 1).

### *Acanthepeira* Marx

*Acanthepeira* Marx, 1883, in Howard, List of Invertebrates of South Carolina, p. 22. Type species designated by Bonnet, 1955, *Bibliographia Araneorum*, 2: 125, is *Acanthepeira spinosa*, a nomen nudum (thus unavailable as type species). I here designate *Epeira stellata* Walckenaer the type of the genus. The generic name is feminine.

*Marxia* McCook, 1893, *American Spiders*, 3: 192. Type species by original designation *Epeira stellata* Walckenaer. The generic name is feminine.

*Note.* Marx, in his list of South Carolina spiders, listed three specific names in combination with *Acanthepeira*, one of them *stellata*, but did not indicate that the name *Acanthepeira* was new. The name thus was not used until Kaston (1938) substituted it for *Marxia*. Since then it has been the only generic name in use for *A. stellata*. Because the name *Acanthepeira* first appeared in Marx's list without comment, the name has not even been listed in the *Zoological Record* or by Neave (1939).

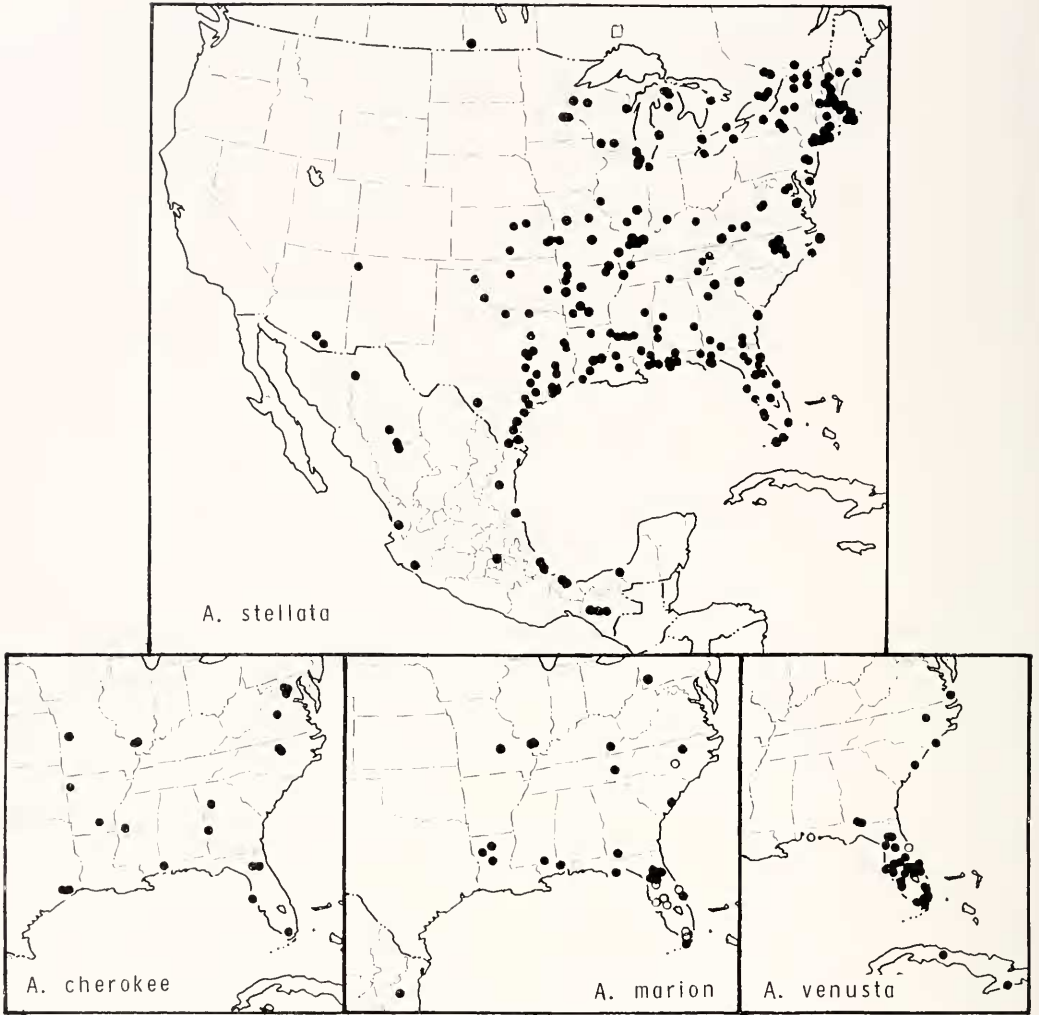
*Diagnosis.* *Acanthepeira* has the anterior eye row procurved as seen from in front, the lateral eyes closer to the clypeus than to the medians; the height of the clypeus in the median area is about two to three diameters of the anterior median eyes. The lateral eye tubercle differs from *Wagneriana* and all other genera in being spine-

shaped, pointing anteriorly (Figs. 12, 13). As in *Wagneriana*, the head part of the carapace appears swollen and is much higher than the eye area immediately in front of it (Fig. 13). The abdomen has a projecting anterior median tubercle (Fig. 12); there is no such hump in the related *Paraucixia* and *Wagneriana*.

*Genitalia.* The scape of the female epigynum is a short compact drawn-out cone bent posteriorly, differing in shape in different species. The short scape is not set off from the base (Figs. 14, 29, 36, 51).

The palpus, especially the embolus, appears to be relatively simple. There are no apophyses or lamellae attached to the embolus (Fig. 21). As in other genera described here, and less so in the related *Eriophora* (Levi, 1970), the attachment of the bulb differs from that of *Araneus* species as all sclerites face the median, and are completely hidden by the tegulum in lateral view (Figs. 19, 20). In *Araniella*, *Nuctenea*, *Zygiella*, *Araneus*, *Neoscona*, *Singa*, *Hypso-singa*, *Larinia*, and *Mangora* the terminal apophysis is distal and crowns the palpal bulb, while in *Singa* the terminal apophysis covers even the lateral side. There is no terminal apophysis in *Acanthepeira* and in the related *Eriophora*, but there is a paramedian apophysis (pm in Fig. 21) on which the base of the embolus (e) rests. The paramedian apophysis is hidden in the contracted embolus by the cymbium (y). There is no scale or cap on the embolus and adult males are found from spring until fall. Males appear to be longer lived than those of *Araneus*, which can mate only once. The palpal patella has one macroseta, as is characteristic of this group of genera. The first coxa of the male lacks the distal hook present in *Paraucixia* and *Wagneriana*.

*Coloration.* Carapace has white setae and a narrow light border around dark sides of thorax, and black rings around posterior median eyes. Chelicerae brown. Sternum brown, indistinctly marked. Legs with narrow bands. Abdomen brown with



Map 2. Distribution of *Acanthepeira* species. Open circles are records of specimens which appear intermediate.

indistinct light and dark marks on dorsum, and dark spots on venter, but white marks are lacking except sometimes in *A. venusta*, which may have a white transverse mark or two white spots side by side behind the genital groove.

*Structure.* Carapace highest in head region, lacking a thoracic depression in female, but with a shallow indistinct depression in male. In size, the anterior median eyes are slightly larger or subequal to secondary eyes; in females of *A. stellata*

the anterior medians are smaller. The anterior median eyes are about their diameter apart, the posterior medians 1.2 to 1.5 diameters apart in females, one to two diameters in males. The anterior margins of the chelicerae each have one tooth at the base of the fang and three or four at some distance; the posterior margin has four teeth and denticles. The abdomen is soft and the number of tubercles varies within species, but there is always an anterior median tubercle. In some specimens

of *A. marion*, the caps of the tubercles are slightly sclerotized (Fig. 40). The abdomen of *A. venusta* is narrower and the anterior median tubercle longer than in other species (Fig. 55).

*Species.* The species look similar. They differ in size, but sizes overlap. Females differ in the structure of the scape, males in the armature of the last coxa and femur (Figs. 22–28), but only slightly in the palpi (Figs. 19, 35, 41, 56). Males also differ slightly in leg length, but this character overlaps. The first patella-tibia of *A. cherokee* is 1.1 times carapace length, of *A. marion* 1.1 to 1.3, of *A. stellata* 1.2 to 1.3, and of *A. venusta* 1.3 to 1.4.

As far as I know, there are no *Acanthepeira* species other than the four species from North America.

*Species problems.* It is exceedingly difficult to separate some *Acanthepeira* specimens from the southeastern United States and it appears that three species interbreed. Specimens that appear to be intermediates have been found (Figs. 45–50, note difference in size).

Perhaps there were originally three species in the Southeast: *A. cherokee*, most distinct in structure and habitat preference (moist bottomland woods); the large *A. marion*; and the small, common *A. venusta*. Then, with the spread of the intermediate-sized *A. stellata* into Florida, perhaps species barriers broke down, and introgression occurred between *A. marion*, *A. stellata*, and *A. venusta*. In most theridiid and araneid species, the Florida specimens are the smallest. However, Florida specimens of *A. stellata* are larger than those from other parts of the range, possibly as a result of competition with the small *A. venusta*. Only field work in the southeastern states can answer some of the questions.

*Misplaced species.* Two species have been incorrectly assigned to this genus. The types of both are lost in the United States National Museum. Judging by the illustrations, neither has the anterior median tubercle characteristic of *Acanthepeira*.

*Marxia grisea* McCook, 1893, American Spiders, 3: 195, pl. 13, fig. 10, ♀. Female type allegedly from “Biscayne Bay, Florida,” an erroneous Marx locality. Specimen lost in the Marx collection of U. S. National Museum. The size of *M. grisea* as described by McCook is much smaller than that of *A. marion*, although the epigynum may be similar. This species is probably a South American *Paravixia*, perhaps a *Wagneriana*.

*Epeira moesta* Keyserling, 1892, Spinnen Amerikas, 4: 108, pl. 5, fig. 80, ♀. Female type is allegedly from “Mariposas, Arizona,” an erroneous Marx locality. Specimen lost in the Marx collection of the U. S. National Museum. This species is probably a South American *Wagneriana*, perhaps *Paravixia*.

KEY TO ACANTHEPEIRA SPECIES, FEMALES

- 1. Scape of epigynum longer than width of epigynum at base (Figs. 36, 51). ..... 2
- Scape of epigynum as long or shorter than width of epigynum at base (Figs. 14, 29). ..... 3
- 2(1) Total length 6 to 10 mm; abdomen narrow, length 1.5 times its width, with anterior median tubercle pointed and projecting (Fig. 55); epigynum 1.6 mm long, scape flattened (Fig. 51); Virginia to Alabama, common in Florida, Cuba. .... *venusta*
- Total length 10 to 16 mm; abdomen about as long as wide, median anterior tubercle not projecting above carapace (Fig. 40); epigynum more than 2 mm long, scape round in cross-section (Fig. 36); Pennsylvania, Missouri, Tamaulipas to Florida. .... *marion*
- 3(1) Epigynum with a constriction proximal to swollen basal portion of scape (Fig. 29); Maryland, Missouri, Texas to Florida. .... *cherokee*
- Epigynum without constriction above slender scape (Fig. 14); Canada to southern Mexico. .... *stellata*

KEY TO ACANTHEPEIRA SPECIES, MALES

- 1. Fourth coxa with a tubercle (Figs. 22, 23, 25); whole region ..... 3
- Fourth coxa smooth, not modified (Figs. 24, 26–28); southeastern states ..... 2

- 2(1) Fourth femur with a proximal, retro-lateral tubercle (Fig. 24). ..... *cherokee*  
 - Fourth femur without such tubercle (Figs. 26-28). ..... *venusta*
- 3(1) Coxal tubercle large (Fig. 25); on fourth femur, the socket of the proximal, retro-lateral macroseta are larger than sockets of more distal macrosetae (Fig. 25); total length 7.0 to 10.4 mm, carapace 3.1 to 4.1 mm wide; southeastern states *marion*  
 - Coxal tubercle small (Figs. 22, 23); sockets of retrolateral macrosetae of fourth femur about equal in size (Figs. 22, 23); south-eastern specimens 6.0 to 8.1 total length, carapace 2.5 to 3.4 mm wide; Canada to southern Mexico. .... *stellata*

### *Acanthepeira stellata* (Walckenaer)

#### Plate 3, Figures 12-23, Map 2

- Epcira stellata* Walckenaer, 1805, Tableau des Aranéides, p. 65. Name for fig. 1, plate 1 of the Bose manuscript drawings of spiders of Carolina, in the Muséum National d'Histoire Naturelle, Paris. Copy of the illustration in the Museum of Comparative Zoology, examined.
- Epcira nobilis* Walckenaer, 1841, Histoire Naturelle des Insectes, Aptères, 2: 119. Name for Albot, fig. 161, p. 16 illustration of a spider from Georgia, in the British Museum, Natural History. Copy in the Museum of Comparative Zoology, examined.
- Epcira stellata*. - Hentz, 1850, J. Boston Soc. Natur. Hist., 6: 22, pl. 3, fig. 12, ♀. Keyserling, 1863, Sitzungsber. Natur. Ges. Isis, Dresden, 140, pl. 6, figs. 24, 25, ♀. Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 319, pl. 34, fig. 17, pl. 37, figs. 3-5, ♀, ♂. Emerton, 1902, Common Spiders, p. 179, figs. 419, 420, ♀, web.
- Acanthepeira stellata*. - Marx, 1883, in Howard, List of Invertebrate Fauna of South Carolina, p. 22. Roewer, 1942, Katalog der Araneae, 1: 777. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 234, figs. 714-716, 734, 2038, ♀, ♂, web.
- Cyrtarachne dugesi* O. P.-Cambridge, 1893, Biologia Centrali-Americana, Araneidea, 1: 113. Female from Guanajuato, Mexico in the British Museum, Natural History, lost.
- Cyrtarachne mexicana* O. P.-Cambridge, 1893, Biologia Centrali-Americana, Araneidea, 1, pl. 14, fig. 13, ♀ [nomen nudum]. Apparently this illustration belongs with *C. dugesi*.
- Marxia stellata*. - McCook, 1893, American Spiders, 3: 193, pl. 12, fig. 4, ♀, ♂. F. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea 2: 481, pl. 45, figs. 21, 22, ♀. Comstock, 1912, Spider Book, p. 455, figs. 468, 469, ♀, egg sac. Comstock, 1910, The Spider Book, rev. ed., p. 470, figs. 468, 469, ♀, egg sac.
- Marxia nobilis*. - McCook, 1893, American Spiders, 3: 194, pl. 13, figs. 7-9, ♀, ♂.
- Acanthepeira venusta*. - Bryant, 1949, Psyche, 56: 175, figs. 4, 5, ♂. Not *A. venusta* Banks.
- Araneus stellatus*. - Bonnet, 1955, Bibliographia Araneorum, 2(1): 603.

*Description* of female from Florida. Total length 9.0 mm. Carapace 4.0 mm long, 3.6 wide. First femur, 3.7 mm; patella and tibia, 4.5; metatarsus, 2.9; tarsus, 1.2. Second patella and tibia, 4.2 mm; third, 2.3; fourth, 3.6.

Male from Texas. The abdomen is like that of the female. Total length 8.0 mm. Carapace 4.2 mm long, 3.5 wide. First femur, 3.6 mm; patella and tibia, 4.6; metatarsus, 3.8; tarsus, 1.4. Second patella and tibia, 4.0 mm; third, 2.2; fourth, 3.2.

*Variation*. Total length of females 7.0 to 15.1 mm, carapace 3.4 to 6.3 long, 3.0 to 5.2 wide. Total length of males 5.1 to 8.1 mm, carapace 2.5 to 4.3 long, 2.0 to 3.4 wide. The first patella and tibia of males is 1.2 to 1.3 times the carapace length. The smallest individuals are from the northernmost localities, the largest southern. While most Florida specimens are intermediate in size, both large and small individuals are found there. Florida specimens are often darker with a light line between the anterior lateral humps, bordering an area that is darker anteriorly, lighter posteriorly. Florida specimens and some others have

Figures 12-21. *Acanthepeira stellata* (Walckenaer). 12, 13. Female. 14-17. Epigynum. 14. Ventral. 15. Posterior. 16. Lateral. 17. Posterior, cleared. 18. Female, eyes and chelicerae. 19-21. Left palpus. 19. Mesal view, cymbium cleared. 20. Ventral view. 21. Expanded, subventral view.

Figures 22-28. *Acanthepeira* male, fourth coxae and proximal part of fourth femora. 22, 23. *A. stellata*. 24, *A. cherokee*. 25. *A. marion*. 26-28. *A. venusta*.



**Abbreviations.** c, conductor; e, embolus; m, median apophysis; pm, paramedian apophysis; r, radix; t, tegulum; y, cymbium.

**Scale lines.** 0.1 mm, except Figs. 12, 13, 22-28, 1 mm.

the scape of the epigynum straight rather than curled, and relatively long, almost as long as the width of the epigynum base. Because individuals with longer scapes were collected with individuals having shorter scapes, and their coloration was the same, matching that of accompanying males of *A. stellata*, I make the assumption that scape length is individually variable and does not indicate different species.

*Diagnosis.* This is the only species of *Acanthepeira* over most of its range (Map 2). There are, however, three other species in the southeastern states. *Acanthepeira stellata* females differ from those of other species by the relatively small, curled scape of the epigynum (Fig. 14); males by having the tubercle on the fourth coxa (Figs. 22, 23) always present, and by having the bases of the macrosetae on the retrolateral surface of the fourth femur all the same size (Figs. 22, 23). In *A. marion* the most proximal base of the seta is larger. There are specimens that appear intermediate with the smaller *A. venusta* and with the larger *A. marion* (Figs. 46-50).

*Natural history.* This species is found in meadows and fields and is abundant where found. Specimens have been found in alfalfa and in a cornfield in Ontario, and in Nova Scotia in an apple orchard. They are reported from bayberry bushes (*Myrica* sp.) and sand dunes in Massachusetts; on a sandy beach at Lake Erie, Pennsylvania; in beach, oak and maple woods and on sand in Michigan; in arbor-vitae (*Thuja* sp.) and on a building in Wisconsin. It has been collected by beating soybeans in North Carolina; in an avocado grove in Florida; in low grass in Alabama; by sweeping an old field in Louisiana; on shrubs and tall grass in Texas, and in Georgia from

mature beech-magnolia forest (W. Sedgwick, personal correspondence). Comstock (1940) reports the species from low bushes, weeds and grass, with orbs 15 to 25 cm diameter, "hub nearly open, the central space crossed by comparatively few lines; there is a distinct notched zone and a free zone and usually from 20 to 35 viscid spirals. The spider is sometimes found in the orb in midday, but usually rests in a retreat made in the dead head of a plant [which is] one of the supports of the web . . . the mass of eggs is attached to a leaf and enclosed in a mass of loose brown silk (fig. 469)." Kaston (1948) reports 25 radii in the orb and shows a half finished orb (fig. 2038). Males are mature in central and northern states from May to September, females from May to October. *Acanthepeira* have been observed to balloon at 300 m altitude on 13 December (Crosby and Bishop, 1936, *J. Entom. Soc. New York*, 44: 47).

*Distribution.* Canada to southern Mexico (Map 2). I have examined juvenile specimens believed to be this species from British Columbia and California, but these are not mapped.

#### *Acanthepeira cherokee* n. sp.

Figures 24, 29-35, 42, 43, Map 2

*Type.* Female holotype from southwest of route 751 at Mud Creek, Durham County, North Carolina, bottomland pine and hardwood forest, 23 September 1964 (J. W. Berry), in the Museum of Comparative Zoology. The name is a noun in apposition, after the southeastern Indian tribe.

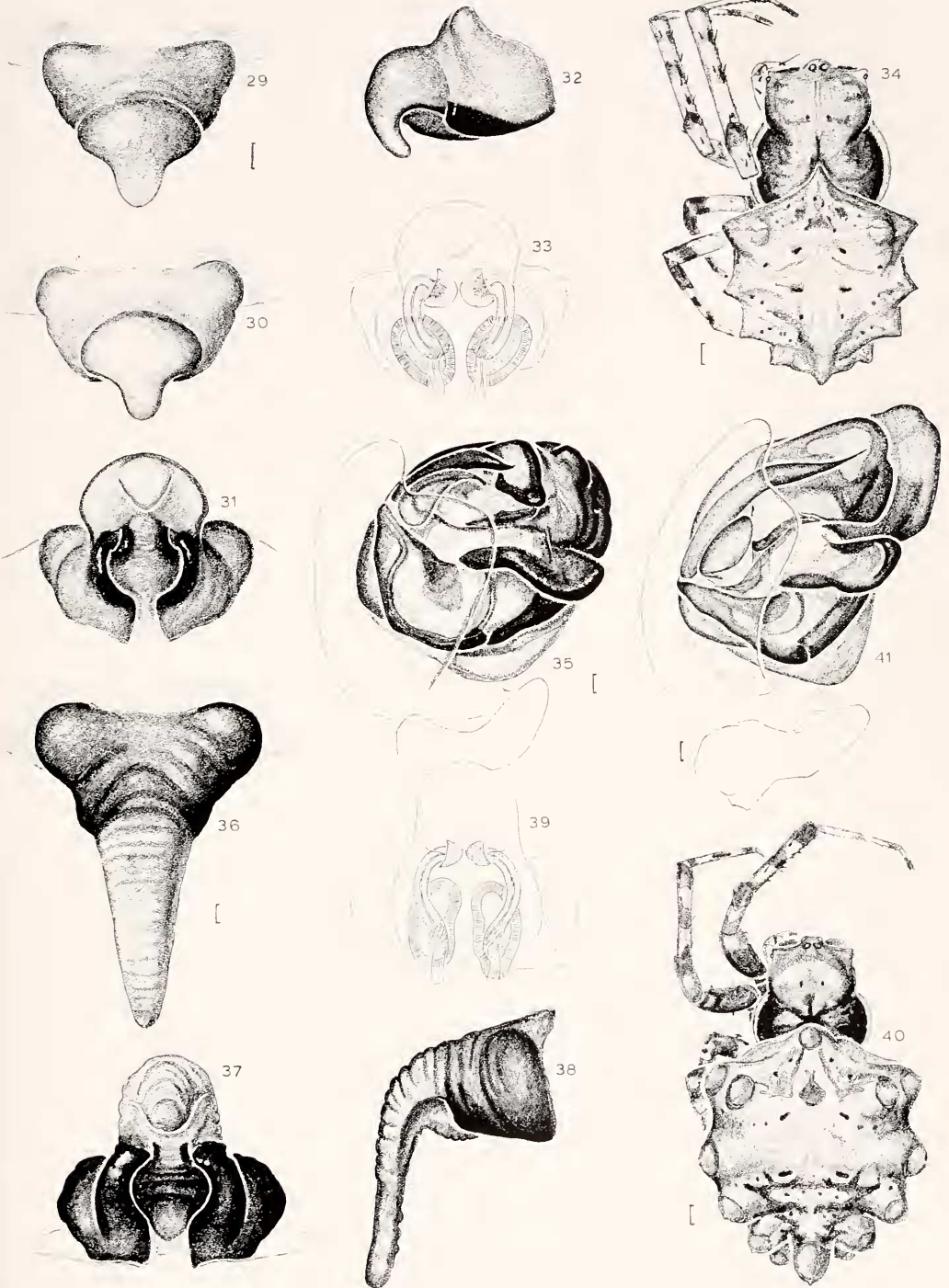
*Description* of female holotype. The humps of the abdomen are relatively low and may be indistinct. Total length 8.3 mm. Carapace 4.3 mm long, 3.9 wide. First

Figures 29-35. *Acanthepeira cherokee* n. sp. 29-33. Epigynum. 29. Anteroventral. 30. Ventral. 31. Posterior. 32. Lateral. 33. Posterior, cleared. 34. Female. 35. Left male palpus, mesal view, cymbium cleared.

Figures 36-41. *A. marion* n. sp. 36-39. Epigynum. 36. Ventral. 37. Posterior. 38. Lateral. 39. Posterior, cleared. 40. Female. 41. Male palpus, mesal view, cymbium cleared.

Scale lines. 0.1 mm, except Figs. 34, 40, 1.0 mm.





femur, 3.4 mm; patella and tibia, 4.6; metatarsus, 2.7; tarsus, 1.4. Second patella and tibia, 4.7 mm; third, 3.0; fourth, 4.0.

Male from Georgia. Total length 11.0 mm. Carapace, 5.2 mm long, 4.1 wide. First femur, 4.1 mm; patella and tibia, 5.6; metatarsus, 3.5; tarsus, 1.4. Second patella and tibia, 5.3 mm; third, 3.4; fourth, 4.7.

*Variation.* Females vary in total length from 8.3 to 10.4 mm, carapace 4.1 to 4.3 long, 3.5 to 3.9 wide. Male total length 6.5 to 10.9 mm, carapace 3.6 to 5.2 long, 3.0 to 4.1 wide. In males, first patella and tibia is 1.1 times the carapace length. No intermediates were found with other species. One female had an abnormal epigynum (Figs. 42, 43).

*Diagnosis.* Females differ from those of other *Acanthepeira* species in having low abdominal humps (Fig. 34) and in having a constriction proximal to a swollen area at the base of the short epigynal scape (Figs. 29, 31). Males differ in the lack of tubercles on the fourth coxa, and in the presence of a large tubercle on the base of the fourth femur (Fig. 24). The palpal embolus is shorter and the radix higher than in other species (Fig. 35) and both these structures are hidden by the cymbium.

*Natural history.* Mature males have been found in February, April and September to November, mature females in March, June, and September. Specimens have been collected in bottomland hardwood by sweeping, bottomland pine and hardwood in North Carolina, at a water reservoir in Illinois, and eating an ant while hanging on a thread in woods around swamp in southern Georgia (W. Sedgwick, personal correspondence).

*Distribution.* The southeastern states, from Maryland to Missouri, Texas, and Florida (Map 2).

*Acanthepeira marion* n. sp.

Figures 25, 36-41, 44, Map 2

*Type.* Female holotype from Marion County, Florida, 21 March 1959 (J. Me-

Crone, B. Mount), in the Museum of Comparative Zoology. The name is a noun in apposition, after the type locality.

*Description.* Female. The abdomen is encircled by rounded humps that are sometimes slightly sclerotized. Total length 18 mm. Carapace 7.3 mm long, 6.1 wide. First femur, 5.8 mm; patella and tibia, 7.6; metatarsus, 4.0; tarsus, 2.2. Second patella and tibia, 6.9 mm; third, 4.3; fourth, 6.0.

Male from Louisiana. The tips of the abdominal tubercles are more pointed than in the female. Total length 10.4 mm. Carapace, 5.0 mm long, 4.1 wide. First femur, 5.1 mm; patella and tibia, 6.3; metatarsus, 4.1; tarsus, 1.7. Second patella and tibia, 5.4 mm; third, 3.5; fourth, 4.9.

*Variation.* Females vary in total length from 10.2 to 15.5 mm, carapace 5.1 to 5.9 long, 4.3 to 5.6 wide. Male total length 7.0 to 10.4 mm, carapace 4.1 to 5.0 long, 3.1 to 4.1 wide. In males the first patella-tibia is 1.1 to 1.3 times carapace length. The humps on the abdomen are variable in size and shape. Numerous individuals appear to be intermediate with *A. stellata*, having smaller size, shorter epigynum (Figs. 46, 47) and smaller tubercles on the fourth coxa and femur. The smallest individuals all come from the northernmost localities.

*Diagnosis.* The long scape of the epigynum (Fig. 36) and the large size of individuals distinguish females from those of other species. The large tubercle on the fourth coxa of males (Fig. 25) and the greater body length is diagnostic for males; some northern *A. stellata* may have large tubercles on the fourth coxae, but specimens from the southeastern states do not. In addition, the base of the most proximal macroseta on the retrolateral surface of the fourth femur is larger than the bases of more distal macrosetae.

*Natural history.* Specimens have been collected in a field in Illinois, in a sand dune area in Georgia, and by sweeping "old fields" in Louisiana and Florida. Mature males have been collected from March to

June, females from March to August and October.

*Distribution.* Southeastern states from Pennsylvania to Missouri, Tamaulipas and Florida (Map 2).

*Acanthepeira venusta* (Banks)

Plate 4, Figures 26–28, 45, 51–56,  
Map 2

*Plectana venusta* Banks, 1896, Trans. Amer. Entomol. Soc., 23: 69. One female, two juvenile syntypes from Punta Gorda, Florida in the Museum of Comparative Zoology, examined.

*Acanthepeira venusta*, – Roewer, 1942, Katalog der Araneae, 1: 777.

*Araneus venustus*, – Bonnet, 1955, Bibliographia Araneorum, 2(1): 628.

*Note.* Specimens have usually been called *A. stellata* in collections.

*Description.* Total length 7.0 mm. Carapace 3.2 mm long, 2.7 wide. First femur, 2.9 mm; patella and tibia, 3.6; metatarsus, 1.7; tarsus, 0.9. Second patella and tibia, 3.1 mm; third, 1.7; fourth, 2.6.

Male. The abdomen is longer than wide. Total length 7.5 mm. Carapace 3.6 mm long, 2.9 wide. First femur, 3.9 mm; patella and tibia, 4.6; metatarsus, 3.0; tarsus, 1.2. Second patella and tibia, 3.8 mm; third, 2.2; fourth, 3.2.

*Variation.* Total length of Florida females 6–10 mm, carapace 2.2 to 3.9 long, 2.0 to 3.2 wide. The largest female came from Santiago de Cuba and had a total length of 11 mm, carapace 4.5 long, 3.6 wide. Total length of males 4.9 to 7.6 mm, carapace 2.6 to 4.0 long, 1.9 to 3.2 wide. First patella and tibia of males is 1.3 to 1.4 times the carapace length.

*Diagnosis.* Females of *A. venusta* can readily be separated from those of *A. stellata* by the shape of the epigynum (Fig. 51); the length of the scape is greater than the width of the base, the reverse of the situation in *A. stellata*. Males of *A. venusta* lack the tubercle on the fourth coxa (Figs. 26–28) characteristic of *A. stellata*. Males of *A. cherokee*, which also lack the tubercle on the coxa, have a proximal tubercle on

the retrolateral surface of the fourth femur, absent in *A. venusta*. Adults of *A. venusta* are distinguished from other species by their smaller size, by the narrower abdomen (its length 1.5 times its width), and by the longer anterior median tubercle (Fig. 55). (Specimens from Cuba, an area where it is the only *Acanthepeira* species, are larger and have a wider abdomen.) Their lighter, less contrasting coloration and much narrower abdomen make it possible to distinguish juveniles of *A. venusta* from the darker, more deeply colored *A. stellata*, with its rounder abdomen. Some females that could not be separated by epigyna are believed to be intermediates (Figs. 48–50); all have a large epigynum and round abdomen, but the scape is shorter than that of *A. venusta*, smaller and longer than that of *A. stellata*.

*Natural history.* *Acanthepeira venusta* can probably be found at all seasons. Specimens have been collected from fields, roadsides, grass, tall grass, grassy cypress (*Taxodium* sp.) and swamp. Several collections came from sawgrass (*Cladium jamaicensis*) in the Everglades. In southern Georgia specimens were found on floating island vegetation in wet places (W. Sedgwick, personal correspondence).

*Distribution.* Virginia to Florida and Cuba (Map 2).

*Wagneriana* F.P.-Cambridge

*Wagneria* McCook, 1893, American Spiders, 4: 203. Type species by monotypy *Epeira tauricornis* O. P.-Cambridge, 1889. Name preoccupied by *Wagneria* Robineau-Desvoidy, 1830, a dipteran; Gistel, 1848, a mollusk; Alenitzin, 1873, a protozoan; Cienkowski, 1882, a protozoan; Jentink, 1886, a mammal; Heilprin, 1887, a mollusk.

*Wagneriana* F. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 497. New name for *Wagneria* McCook, preoccupied. The name is feminine.

*Diagnosis.* The abdomen of *Wagneriana* differs from that of *Acanthepeira* by lacking the median anterior hump (Fig. 62). The carapace is similar to that of *Acanthe-*

*peira* in having the head region swollen behind the eyes, but the lateral eye tubercles are rounded (Figs. 62, 63), rather than cone-shaped as in *Acanthepeira*. The clypeus height is about equal to the anterior median eye diameter (Fig. 64). The embolus and median apophysis are more complex in *Wagneriana* than in *Acanthepeira* (Figs. 69–71). In *W. tauricornis*, a piece breaks off the embolus (Figs. 72, 73) during mating and is transferred to the female epigynum. I do not know whether this occurs also in other *Wagneriana* species. The presence of a paramedian apophysis places *Wagneriana* close to *Acanthepeira*, *Parawixia* and *Eriophora*. *Wagneriana* differs from the last two genera by the shape of the carapace, especially the swollen head region (Figs. 62–64).

*Genitalia.* The epigynum has the small median scape attached broadly to the base; the scape is not annulate (Figs. 57–59). The openings, as in all members of this group of genera, are on the posterior face in a slit (Fig. 59). The seminal receptacles are dumbbell-shaped (Fig. 61).

The median apophysis in the palpus is a huge sclerite facing the ventral side, its structure differing in different species (Figs. 69, 70). The conductor supports the complex embolus (Fig. 71). The embolus has two lateral flat branches, unlike that of *Acanthepeira*, and the lower one bears a scale that breaks off and lodges in the opening of the epigynum (Figs. 59, 72, 73).

*Coloration.* Head region light, thorax brown, sides of thorax black, chelicerae mottled, darker distally. Sternum dark, coxae mottled, legs with narrow bands. Dorsum of abdomen mottled black, brown, and white (Fig. 62). Tubercles white on tips. Sides mottled. Epigastric area black. Dark behind epigynum, lighter on sides and posteriorly in front of spinnerets. There is a thin black line around spinnerets on venter. Color of males like that of females.

*Structure.* Head region of carapace swollen, lateral eyes separate from medians

on a shared tubercle (Figs. 63, 64). The height of the clypeus equals the diameter of the anterior median eyes (Fig. 64). The abdomen is soft, longer than wide, with large tubercles (Figs. 62, 63, 65, 66).

The male is slightly smaller than the female, and similar in shape, except that the carapace is narrower in the region of the anterior median eyes (Fig. 67). The thorax has a median longitudinal line and median eyes more anterior to lateral eyes than in female. The palpal femur lacks a distinct proximal tooth. The palpal patella has one macroseta. The first coxa has a distal hook. The second tibia is slightly swollen and may have macrosetae.

*Species.* There are several Central and South American species which differ considerably from each other both in size and structure of the genitalia.

*Distribution.* The genus is known from the Americas only. One species extends into the temperate area. Records of *W. undecimaculata* from the United States are in error.

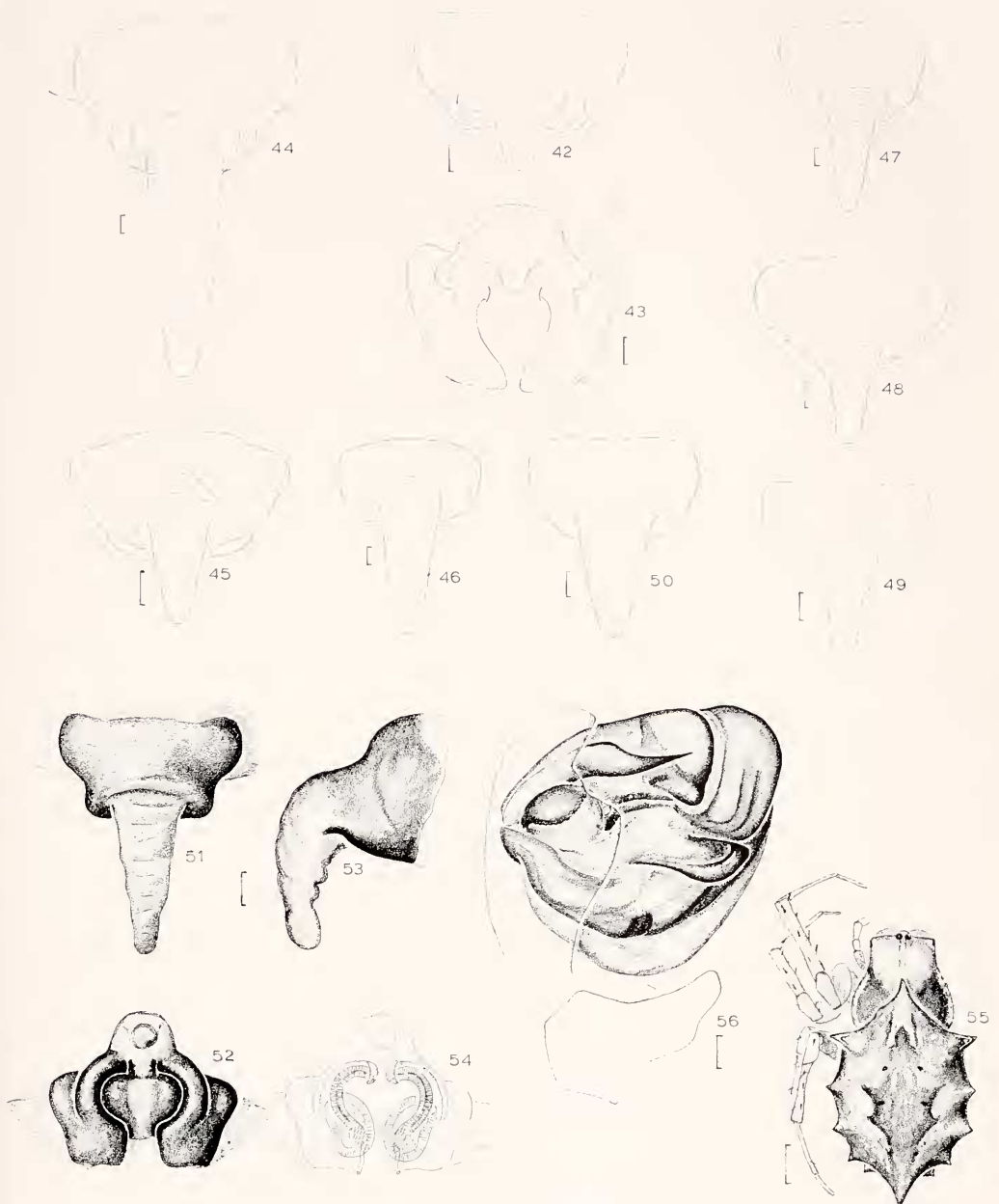
*Wagneriana tauricornis*  
(O.P.-Cambridge)  
Figures 57–73, Map 3

*Epeira tauricornis* O. P.-Cambridge, 1889, *Biologia Centrali-Americana, Araneidea*, 1: 44, pl. 6, figs. 2, 3, ♀, ♂. Many syntype specimens without locality data from numerous localities (as published) in Guatemala and Bugaba and Volcan de Chiriquí, Panama, in the British Museum, Natural History, examined. Keyserling, 1892, *Spinnen Amerikas*, 4: 90, pl. 4, fig. 68, ♂.

*Epeira guatemalensis* O. P.-Cambridge, 1889, *Biologia Centrali-Americana, Araneidae*, 1: 40, pl. 7, fig. 8, ♂ (not ♀). Male syntypes from numerous localities in Guatemala. Keyserling, 1892, *Spinnen Amerikas*, 4: 112, pl. 6, fig. 83b, ♂ (not ♀).

*Wagneria tauricornis*.—McCook, 1893, *American Spiders*, 3: 204, pl. 13, fig. 1, 2, ♀, ♂.

*Wagneriana tauricornis*.—F. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 498, pl. 47, figs. 14, 15, ♀, ♂. Comstock, 1912, *Spider Book*, p. 460, fig. 473, ♀; 1910, rev. ed., p. 474, fig. 473, ♀. Roewer, 1942, *Katalog der Araneae*, 1: 881. Bonnet, 1959, *Bibliographia Araneorum*, 2(5): 4803.



Figures 42-50. Variation of *Acanthepeira* epigyna. 42, 43. *A. cherokee* (Georgia). 42. Ventral. 43. Posterior. 44. *A. marion* (Mississippi). 45. *A. venusta* (Baldwin Co., Alabama). 46-50. Doubtful, intermediate specimens. 46, 47. *A. marion-stellata*. 46. (Monroe Co., North Carolina). 47. (Everglades, Florida). 48-50. *A. stellata-venusta*. 48. (Chihuahua). 49. (North Wales, Pennsylvania). 50. (Osceola, Florida).

Figures 51-56. *Acanthepeira venusta* (Banks). 51-54. Epigynum. 51. Ventral. 52. Posterior. 53. Lateral. 54. Posterior, cleared. 55. Female. 56. Left male palpus, mesal view, cymbium cleared.

Scale lines. 0.1 mm, Fig. 55, 1 mm.



Map 3. Distribution of *Wagneriana tauricornis* (O.P.-Cambridge).

*Description* of female from Florida. Sternum black, coxae mottled. Posterior median and lateral eyes subequal to anterior medians, anterior lateral eyes 0.8. Anterior median eyes slightly more than their diameter apart, posterior median eyes their diameter apart. The chelicerae have four teeth on the anterior margin, two on the posterior. Total length 6.0 mm. Carapace 2.2 mm long, 1.7 wide. First femur, 2.2 mm; patella and tibia, 2.6; metatarsus, 1.4; tarsus, 0.7. Second patella and tibia, 2.1 mm; third, 1.2; fourth, 2.0.

Male from Florida. Median eyes subequal in size, laterals 0.8 diameter of medians. Anterior median eyes their diameter apart, posteriors their diameter apart. Second tibia is slightly swollen with macrosetae. The male has fewer and more distinct

abdominal tubercles than the female (Fig. 67). Total length 5.8 mm. Carapace 2.6 mm long, 1.8 wide. First femur, 2.4 mm; patella and tibia, 2.8; metatarsus, 1.6; tarsus, 0.7. Second patella and tibia, 2.1 mm; third, 1.5; fourth, 1.9.

*Variation.* Total length of females varies 4.3 to 6.1 mm; carapace 1.9 to 2.5 long, 1.5 to 2.0 wide. Total length of males 3.3 to 5.8 mm; carapace 2.0 to 2.6 long, 1.6 to 2.0 wide. All the smallest specimens came from Florida. The shape of the abdomen, especially tail length, is much more variable in Central America (Figs. 65, 66) than in southeastern United States. Central American females may have the epigynum in slightly different proportion, the scape wider or narrower.

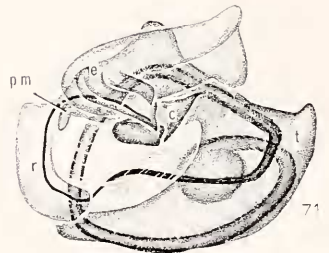
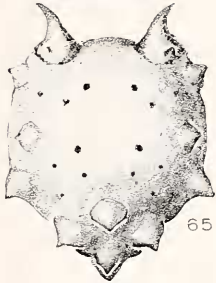
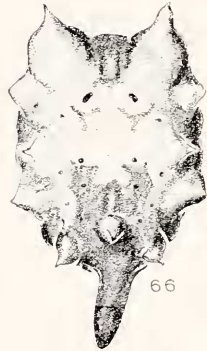
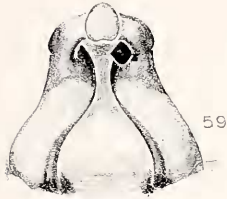
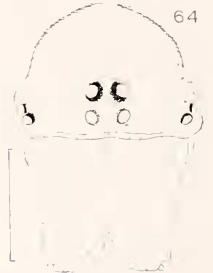
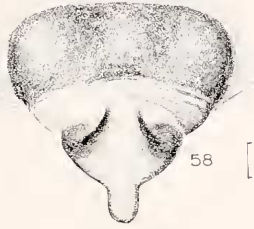
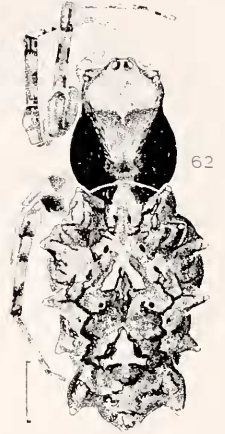
*Diagnosis.* *Wagneriana tauricornis* is smaller than related Central and South American *Wagneriana*. Females can be distinguished from all related species by the constricted neck of the scape of the epigynum (Fig. 57), males by the shape of the embolus and median apophysis of the palpus (Figs. 69, 70) and the macroseta on the fourth trochanter (Fig. 68).

*Natural history.* Specimens have been found on shrubs and trees, by sweeping hophornbeam (*Ostrya virginiana*), on a hammock, in a banana farm, in a swamp, in weeds bordering stream in Florida, and on bromeliads in Mexico. Comstock (1940) writes that a specimen "held its legs closely folded when hanging in its web;" and that when in this position, it looked like a bit of dirt. Archer (1940) indicates that vertical webs are found 1.8 m off the ground on shrubs and trees along streams, ravines and swamp woods. Mature females have

Figures 57–73. *Wagneriana tauricornis* (O.P.-Cambridge). 57–61. Epigynum. 57. Anterior. 58. Ventral. 59. Posterior. 60. Lateral. 61. Posterior, cleared. 62. Female (Florida). 63. Female, lateral. 64. Female eye region and chelicerae. 65, 66. Female abdomens (Guatemala). 67. Male carapace and abdomen. 68. Male, fourth coxae and trochanter. 69–73. Left male palpus. 69. Mesal view. 70. Ventral view. 71. Palpal bulb expanded with median apophysis cut off in subventral view. 72. Embolus with cap. 73. Embolus without cap.

*Abbreviations.* c, conductor; e, embolus; pm, paramedian apophysis; r, radix; t, tegulum.

*Scale lines.* 0.1 mm, except Figs. 62–67, 1 mm.



been collected in March, and from August to December in Florida, males in February, March, July, October, and in December in Florida. Details of the web are not known.

*Distribution.* Georgia, Texas to South America (Map 3).

### *Acacesia* Simon

*Acacesia* Simon, 1895, *Histoire Naturelle des Araignées*, 1: 795. Type species by original designation and monotypy *Epeira foliata* Hentz (= *E. hamata* Hentz). The name is feminine.

*Diagnosis.* *Acacesia* is close to *Wixia*. It differs from *Araneus* and most other genera by the narrow head region and the swollen, bulging area between the median eyes (Fig. 80). The second eye row is strongly recurved, the posterior median eyes anterior to the anterior laterals, and directed sideways rather than dorsally (Figs. 78–80). The anterior median eyes are largest, the ocular quadrangle wider in front than behind. The laterals are separated by almost their diameter. Only in *Wixia* is the eye area similar, and *Acacesia* differs from *Wixia* by the oval shape of the abdomen and its characteristic dorsal pattern present in all species (Figs. 78, 81). The legs are relatively longer than in other genera of this group (Figs. 78, 81).

*Genitalia.* The female epigynum has the scape set off from the base. The scape is flat, not annulate and the openings are in slits on the posterodorsal side (Figs. 74–77). The palpus has a complex embolus resting on a short conductor (Figs. 82, 84). As in other genera of this group, the conductor (c in Fig. 84) faces mesally rather than ventrally as in *Araneus*. The median apophysis is huge (m in Fig. 84). There is a lamella mesal to the embolus, perhaps a terminal apophysis (a). A small scale breaks off the embolus during mating and remains in the epigynum (Fig. 75). There is no paramedian apophysis. In *Acacesia* alone among related genera the paracymbium is modified, and not simply hook-shaped (Fig. 83).

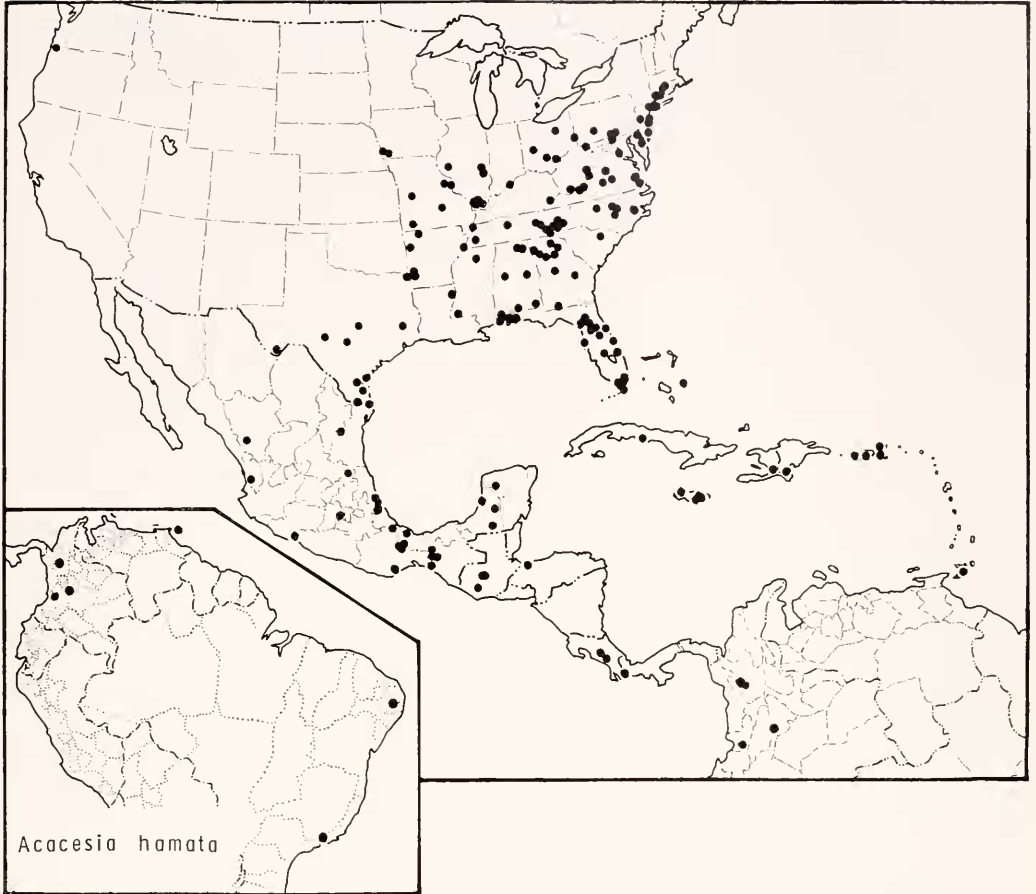
*Coloration.* Carapace, sternum and legs brown; legs not banded. All known species have the same dorsal abdominal pattern: four black lines, the inner ones approaching each other anteriorly and joining posteriorly in the middle of the abdomen; the outer lines join anteriorly and approach each other above the spinnerets. The lines are laterally bordered by a white line (Figs. 78, 81). The area between the lines is darker brown than the color on the sides. Anterolateral is a dark gray patch that continues posteriorly into the dark brown sides. Sides are sharply delimited toward lighter dorsum, but grade into lighter venter. There are no distinct marks on venter. Area between genital groove and spinnerets is darker than sides. Coloration of male deeper (Fig. 81).

*Structure.* Head area of carapace narrow, eyes closely grouped with posterior median eyes directed sideways as result of swelling of median eye area (Figs. 79, 80). Clypeus height subequal to diameter of anterior median eyes. The legs are long, the first patella-tibia about 1.7 times carapace length with hardly any macrosetae. The leg length order is 1, 2, 4, 3 (Figs. 78, 81). The abdomen is suboval, longer than wide, widest in anterior half and without humps (Fig. 78).

Males slightly smaller than females. Thorax with a shallow circular depression, traversed by a longitudinal median line. Head and clypeus height as in female (Fig. 81). The palpal femur has a tooth facing a tooth on the endite. The palpal patella has one macroseta. The first coxa has a large distal hook that fits into a groove on the second femur. The second leg has a ventral row of setae on the femur and a spur on the tibia (Fig. 87). The fourth coxa has a short stout macroseta, as does the fourth trochanter (Fig. 86).

*Species.* Only one species, *Acacesia hamata*, occurs in our region. But there are three or four additional species of *Acacesia*, all Neotropical and all similar in appearance. Juveniles thus can be determined





Map 4. Distribution of *Acacesia hamata* (Hentz).

only north of Mexico. The genitalia of females differ in proportions and amount of sclerotization. Palpi of males differ in the shape of the embolus, but all have a huge biforked median apophysis, slightly narrower in other species than in *A. hamata*.

*Acacesia hamata* (Hentz)  
Plate 5, Figures 74-87, Map 4

*Epeira* ? *hamata* Hentz, 1847, J. Boston Soc. Natur. Hist., 5: 474, pl. 31, fig. 10, ♂. Male type from Alabama in the Boston Soc. Natur. Hist., destroyed.

*Epeira* *foliata* Hentz, 1847, J. Boston Soc. Natur. Hist., 5: 475, pl. 31, fig. 14, ♀. Female type from Alabama in the Boston Soc. Natur. Hist., destroyed. (Not *Epeira foliata* C. L. Koch,

1845.) Emerton, 1884, Trans. Connecticut Acad. Sci., 6: 318, pl. 34, fig. 10, pl. 37, figs. 6-10, ♀, ♂. McCook, 1894, American Spiders, 3: 154, pl. 4, figs. 7, 8, ♀, ♂. F. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 502, pl. 48, figs. 1, 2, ♀, ♂.

*Epeira folifera* Marx, 1890, Proc. U. S. Natl. Mus., 12: 545, 593. New name for *foliata* Hentz, preoccupied.

*Acacesia foliata*, -Comstock, 1912, Spider Book, p. 509, figs. 546-548, ♀. Comstock, 1940, Spider Book, rev. ed., p. 522, figs. 546-548, ♀. Bonnet, 1955, Bibliographia Araneorum, 2: 122.

*Acacesia folifera*, -Roewer, 1942, Katalog der Araneae, 1: 763.

*Acacesia hamata*, -Bryant, 1945, Bull. Mus. Comp. Zool., 95: 364. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 235, fig. 705, figs. 725-726, ♀, ♂.

*Note.* The name *A. hamata* has been used for this common species since Bryant, 1945. Hentz's 1847 description is not very specific and the type is destroyed. However, Hentz's unpublished original colored illustration at Harvard University with outline of palpus and second leg with added description leaves no doubt that he applied *E. hamata* to a male of this species.

*Description* of female from Everglades, Florida. Posterior median eyes 0.9 diameter of anterior medians, lateral eyes 0.6 diameter. Anterior median eyes 1.5 diameters apart, 1.8 from laterals; posterior medians 1.3 diameters apart, 2.2 from laterals. There are four long teeth on the anterior margin of the chelicerae, three on the posterior, denticles between. Total length 6.3 mm. Carapace 2.7 mm long, 2.0 wide. First femur, 4.1 mm; patella and tibia, 4.8; metatarsus, 3.5; tarsus, 1.2. Second patella and tibia, 4.3 mm; third, 1.8; fourth, 3.0.

Male from Georgia. Carapace with one macroseta behind each lateral eye. Swollen area between median eyes bearing a pair of setae. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.4 diameter. Anterior median eyes their diameter apart, their diameter from laterals. Posterior median eyes slightly more than their diameter apart, 2.2 from laterals. Total length 4.8 mm. Carapace 2.1 mm long, 1.8 wide. First femur, 3.5 mm; patella and tibia, 3.7; metatarsus, 2.7; tarsus, 0.8. Second patella and tibia, 2.7 mm; third, 1.4; fourth, 2.2.

*Variation.* Females measure total length 4.7 to 9.1 mm, carapace 2.1 to 2.9 long, and 1.7 to 2.7 wide. Males, total length 3.6 to 4.8 mm, carapace 1.9 to 2.2 long, 1.6 to 1.8 wide. The largest specimens come from Texas and Mexico.

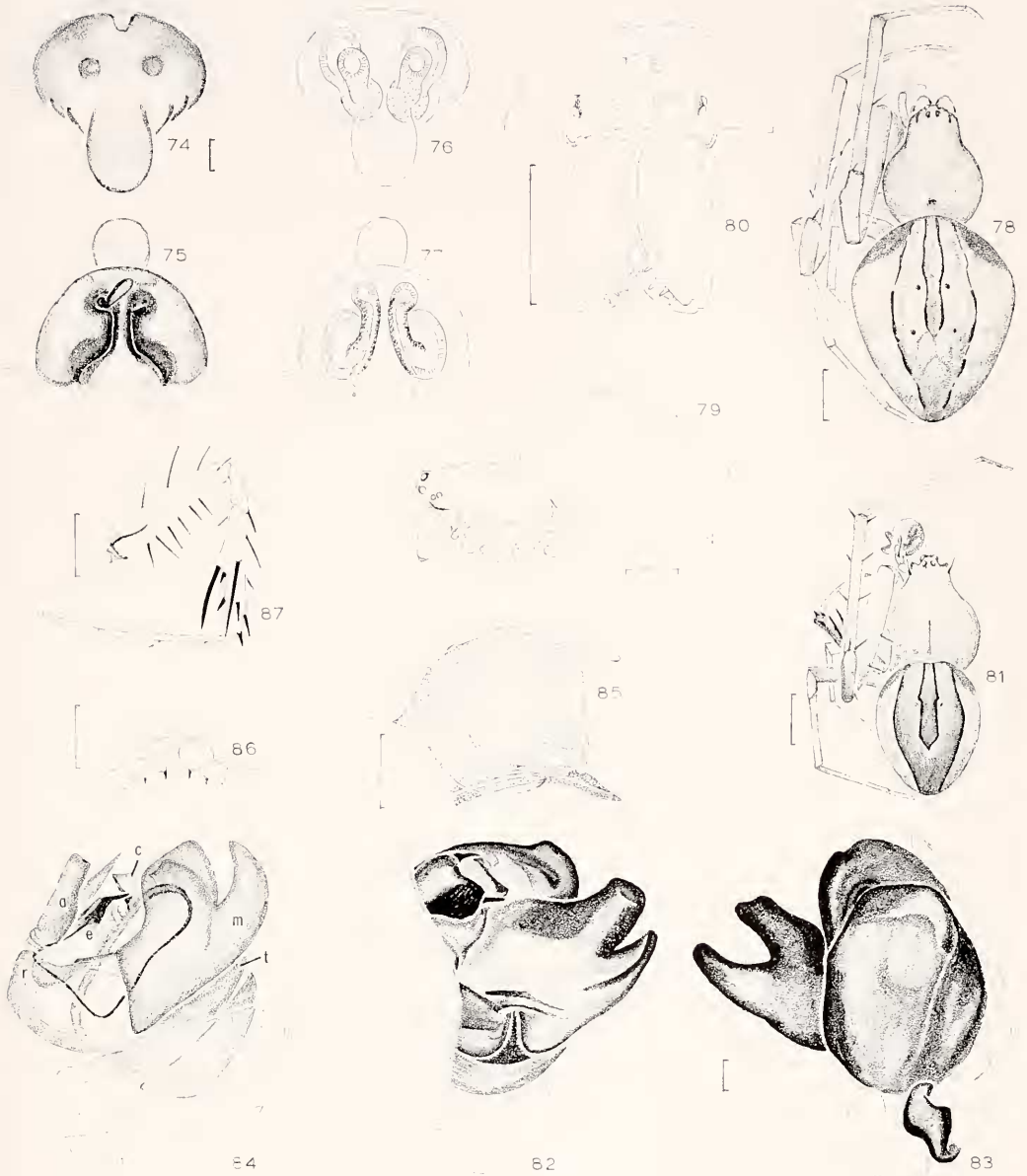
*Diagnosis.* This is the only species of *Acacesia* north of Mexico. *Acacesia hamata* differs from the similar, sympatric *A. cornigera* Petrunkevitch, the common species of Central America and northern South America, and from other species found in Mexico, by the proportions of the genitalia.

In *Acacesia hamata* the scape of the epigynum has a constricted neck and is shorter than the width of the base (Fig. 74); it is the reverse in *A. cornigera*. The male palpus has the median apophysis higher (Fig. 82) than long and also has a small distal spine parallel to the part bearing the embolic duct (Fig. 85). This spine is absent in other species that have the median apophysis longer than high.

*Natural history.* I have collected the species by sweeping shrubs in a cranberry bog in the pine-barrens of New Jersey. It has also been found in bottomland pine-hardwood in North Carolina, floodplain in Louisiana, and second growth oak-hickory woods in Missouri. In northern states males are mature from late July until early September and mature females can be found from late June until September. In the tropics males have been found in various months. In Florida, mature females were found in November, December and March.

J. E. Carico provided information on the webs of ten females observed in Virginia (in letter). Webs are built in tall weeds, 1.2 to 1.5 m from the ground. Two webs were found in low branches of trees at the margin of a lawn. The web is made precisely at sundown. Web is removed at sunrise. No exceptions to this were observed. All females made a web every evening. The spiders remained in the hub during the night, head down with legs partly extended (Plate 5). The webs averaged 33 radii and 118 spirals. The structure is very fine and dense with spirals close together. Photographing the web is difficult because adjacent spirals stick together under the weight of flour particles used in making it visible (Plate 5). The outline of the web is triangular. No retreat is made. The spider "rests" in a different location in vegetation each day, usually within six inches of the last resting place (Plate 5). Web is located differently each evening.

*Distribution.* Eastern United States from Connecticut to Iowa, south to Florida, Texas and to northern Brazil (Map 4).



Figures 74-87. *Acacesia hamata* (Hentz). 74-77. Epigynum. 74. Ventral. 75. Posterior. 76. Ventral cleared. 77. Posterior cleared. 78. Female, dorsal. 79. Female, lateral. 80. Female eye region and chelicerae. 81. Male. 82-85. Male left palpus. 82. Mesal. 83. Ventral. 84. Expanded. 85. Embolus. 86. Fourth coxae and trochanters. 87. Second left leg, prolateral.

**Abbreviations.** a, terminal apophysis; c, conductor; e, embolus; m, median apophysis; r, radix; t, tegulum.

**Scale lines.** 0.1 mm; except Figs. 78-81, 1.0 mm.

*Wixia* O.P.-Cambridge

*Wixia* O. P.-Cambridge, 1882, Proc. Zool. Soc. London, p. 437. Type species by monotypy *Wixia abdominalis* O. P.-Cambridge. The name is feminine.

*Ocrepeira* Marx, 1883, in Howard, List of Invertebrates of South Carolina, 11: 22. Type species by monotypy *Epcira ectypa* Walekenaer.

*Anamra* O. P.-Cambridge, 1889, Biologia Centrali-Americana, Araneidea, 1: 55. Type species by monotypy *A. bituberosa* O. P.-Cambridge, 1889.

*Notes.* *Wixia abdominalis* is a South American species known from juvenile specimens only. Neave (1939) does not list *Ocrepeira*, perhaps because Marx failed to indicate that he was introducing a new name.

*Diagnosis.* *Wixia* differs from other genera included in this paper by having the abdomen at an angle to the cephalothorax (Fig. 107), as in *Maugora*, but *Maugora* has trichobothria on the third tibia and *Wixia* does not. *Wixia* differs from *Scoloderus* by the low cephalothorax (Fig. 92). Sometimes the anterior part of the abdomen is extended and projects up. Like *Acacesia*, *Wixia* has the posterior median eyes well separated and directed laterally rather than dorsolaterally, the area between appearing swollen (Figs. 92, 105). Unlike other genera including *Acacesia*, *Wixia* has the clypeus almost as high as two diameters of the anterior median eyes, and the legs are short and thick (Figs. 92, 105).

*Genitalia.* The epigynum is a heavily sclerotized structure with a wide posterior-facing lobe in ventral view. The ventral view and shape of the abdomen are variable within species. The posterior view is diagnostic for species determination (Figs. 89, 102, 117). The seminal receptacles are oval with an atrium between them and the opening. Into the atrium opens a lobe with a seemingly spiral lumen (Figs. 91, 104, 119).

The median apophysis of the palpus (m in Figs 98, 99) is an enormous structure with a long distal prong at right angles to the long axis of the palpus (Figs. 97, 109,

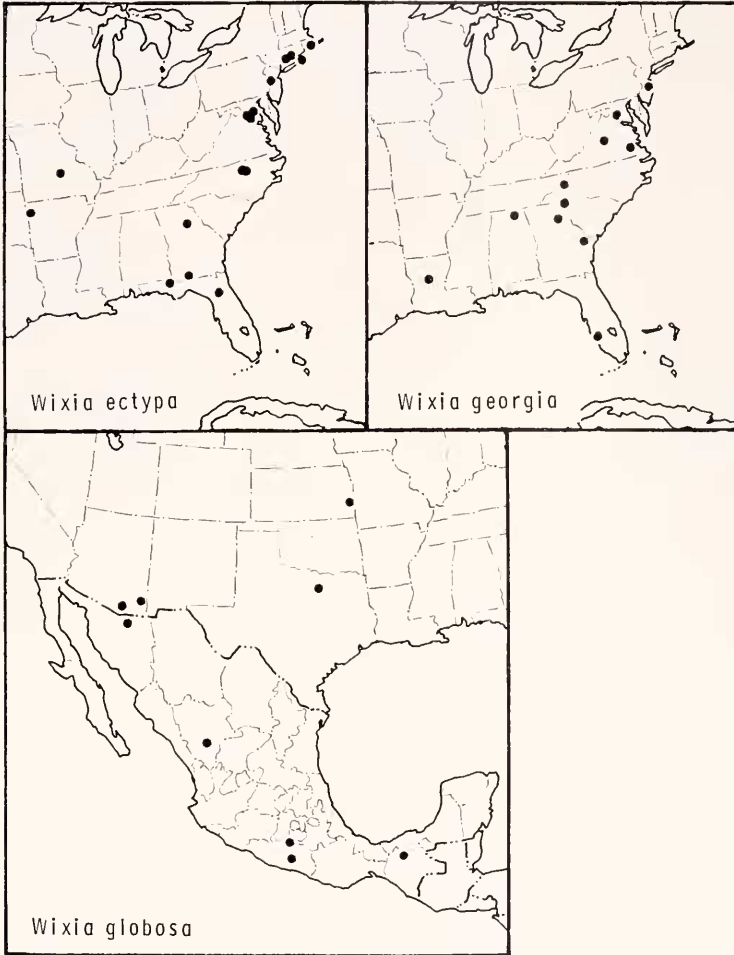
122). The paramedian apophysis is a basal lobe of the conductor (c in Figs. 98, 99). The terminal apophysis (a), an E-shaped structure lying above the embolus and hardly separated from it (Figs. 113–115), is diagnostic.

*Coloration.* Similar in all species north of Mexico. Carapace brown with black marks and light setae, but no hair between median eyes. Distal half of chelicerae darker than basal half. Sternum brown with darker borders. Coxae light, distal parts of legs banded more distinctly dorsally than ventrally; legs darker dorsally than ventrally. Abdomen mottled dorsally with two transverse black marks whose lateral ends point anteriorly (Figs. 93–95). Sides and venter gray.

*Structure.* Height of clypeus 1.5 to 2 diameters of anterior median eyes. Median eye area swollen, and posterior median eyes facing laterally. Posterior median eyes slightly larger to 1.4 times diameter of anterior medians, laterals about 0.8 diameter of anterior medians. The anterior median eyes are one to two diameters apart, as are the posterior medians. The legs are heavy, short and setose (Fig. 105); the first patella-tibia is 1.0 to 1.2 times carapace length in both sexes. The hairy abdomen is attached at an angle to the cephalothorax and its shape is variable within species, having one median anterior hump, two humps, or none.

Males are only slightly smaller than females and do not have longer legs. The thorax has a median longitudinal line with a transverse branch pointing anteriorly in the midline. The femur of the palpus has a proximal tooth, the palpal patella one macroseta. The first coxa has a distal lateral hook and the second femur a groove. The second tibia is swollen and has strong macrosetae (Figs. 110–112); the patella has a slit on the posterior side. The first femur has on the venter, distally a line of macrosetae, the second femur has a complete line of macrosetae.

*Natural history.* All three species are rarely collected but are found in wasp



Map 5. Distribution of *Wixia* species found north of Mexico.

nests (Levi, 1973). They probably make their unknown orbs in trees and rest at daytime appressed to twigs.

*Species.* There are three species north of Mexico, of which only mature individuals can be determined, on the basis of differences in genitalia; the abdomen is variable within species. There are perhaps six additional species in tropical America, none in other parts of the world.

KEY TO FEMALE *WIXIA*

- 1. Openings on side of epigynum (Figs. 89, 91). ..... *ectypa*

- Openings posteriorly on epigynum (Figs. 102, 104, 117, 119). ..... 2
- 2(1) Epigynum with a deep transverse groove posteroventral to posterior median lobe, seen on upper part of Fig. 117. .... *globosa*
- Epigynum slightly swollen posteroventral to posterior median lobe, Fig. 103 and seen on upper part of Fig. 102. .... *georgia*

KEY TO MALE *WIXIA*

- 1. Terminal apophysis, E-shaped in Figs. 108, 114, 115, 121, with "bottom" and "top" prong subequal in size. .... 2
- Terminal apophysis with "top" prong much larger than "bottom" prong (Figs. 96, 113). ..... *ectypa*
- 2(1) Middle prong of terminal apophysis

shorter than other two (Fig. 115); long prong of median apophysis with diameter one-third height of median apophysis (Fig. 122). ..... *globosa*

- Middle prong of terminal apophysis as long as other two (Fig. 114); long prong of median apophysis with diameter less than one-quarter height of median apophysis (Fig. 109). ..... *georgia*

### *Wixia ectypa* (Walckenaer)

Figures 88–100, 110, 113, 123, Map 5

*Epeira ectypa* Walckenaer, 1841, Histoire Naturelle des Insectes Aptères, 2: 129. Types are figs. 143 and 144 of Abbot's manuscript illustrations of Georgia spiders, in the British Museum, Natural History, copy of manuscript in Museum of Comparative Zoology, examined. Keyserling, 1863, Sitzungsber. Naturwiss. Isis Dresden, p. 135, pl. 6, figs. 13–16, ♀, ♂.

*Epeira infumata* Hentz, 1850, J. Boston Soc. Natur. Hist., 6: 19, pl. 3, fig. 4, ♀. Female types from North Carolina and Alabama in the Boston Natural History Society, destroyed. Emerton, 1884, Trans. Connecticut Acad. Sci. 6: 319, pl. 37, figs. 11–13, ♀.

*Ocrepeira ectypa*, -Marx, 1883, in Howard, List of Invertebrates of South Carolina, 11: 22.

*Wixia ectypa*, -Keyserling, 1892, Spinnen Amerikas, 4: 46, pl. 2, fig. 38, ♀, ♂. McCook, 1893, American Spiders, 3: 205, pl. 13, figs. 4, 5, ♀, ♂. Comstock, 1912, Spider Book, p. 467, fig. 481, ♀; 1940, rev. ed., p. 481, fig. 481, ♀. Roewer, 1942, Katalog der Araneae, 1: 882. Kaston, 1948, Bull. Connecticut Geol. Natur. Hist. Surv., 70: 230, figs. 728–730, ♀. Bonnet, 1959, Bibliographia Araneorum, 2: 4828.

*Wixia anaglyphe*, -Chamberlin and Ivie, 1944, Bull. Univ. Utah. Biol. Ser., 8(5): 115. Archer, 1951, Amer. Mus. Novitates, no. 1487, figs. 50, 54, ♀ (error in determination, not *Epeira anaglyphe* Walckenaer).

*Wixia hentziana* Archer, 1951, Amer. Mus. Novitates, no. 1487, figs. 48, 52, ♀. Female holotype from Florida [no locality] in the American Museum of Natural History, examined. NEW SYNONYMY.

*Note.* Although Abbot's illustration of the type of *E. ectypa* is not species diagnostic, and neither is that of Hentz, the old specimens which were examined and used by Keyserling and Emerton were of this species and not the species here called *W. georgia*.

Chamberlin and Ivie (1944) used the name *Wixia anaglyphe* for this species.

*Epeira anaglyphe* Walckenaer, 1805, Tableau des Aranéides, p. 58, with the type Bosc's manuscript illustration, plate 5, no. 6 (labeled "*Aranea hamata*") of the spiders of Carolina in the Muséum National d'Histoire Naturelle, Paris (copy of plate in the Museum of Comparative Zoology, examined) is a *Mimetus*, Mimetidae, and certainly not this species. In an 1841 citation Walckenaer (Histoire Naturelle Insectes Aptères, 2: 12) also cites Abbot's figure 349 to be *Epeira anaglyphe*. This, unlike the Bosc drawing, appears to be a *Wixia*. The type of Archer's *W. hentziana* is a large specimen, its abdomen twice the length of the Georgia ones illustrated, but the epigynum hardly differs in size or shape.

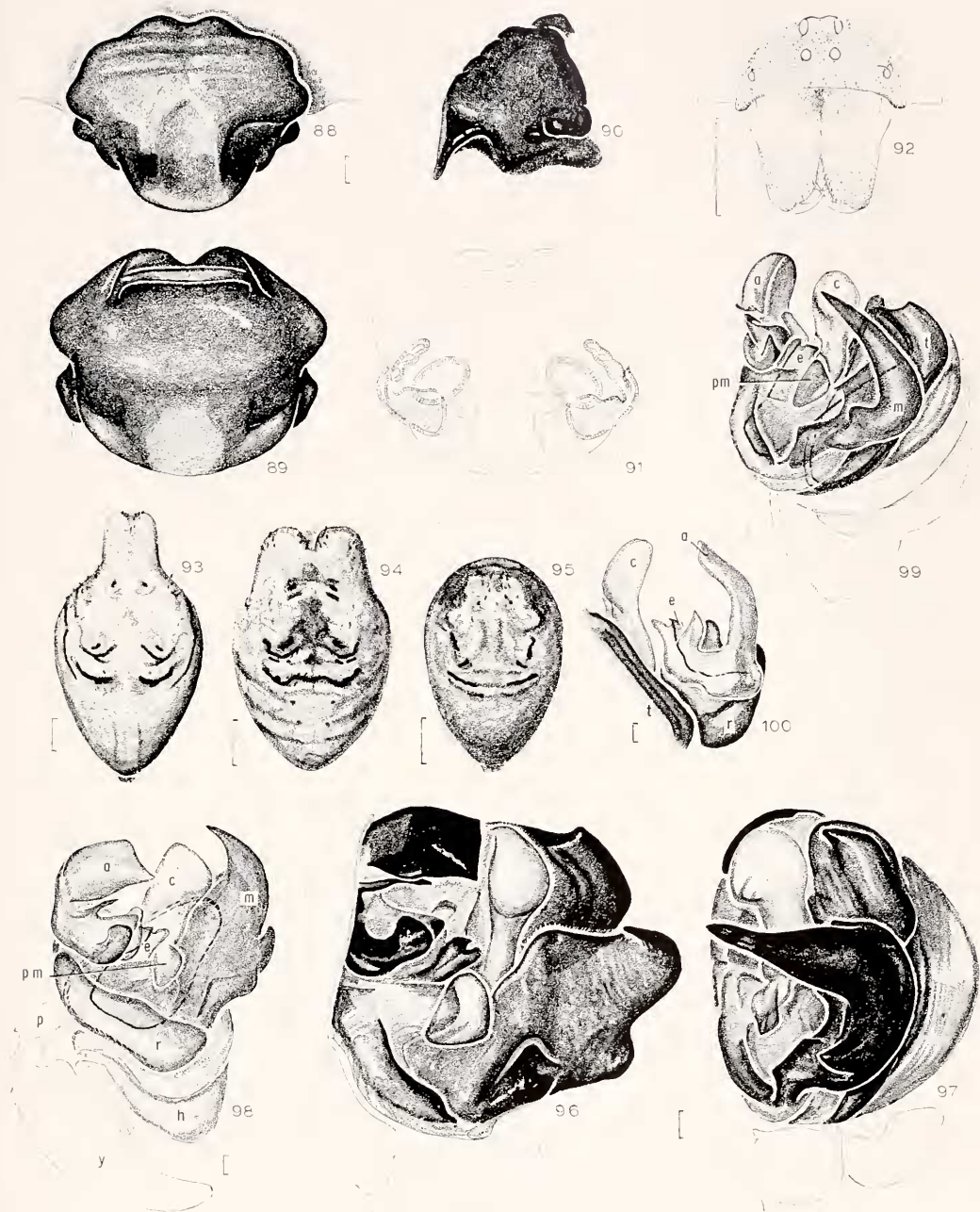
*Description.* Female. Total length 5.2 mm. Carapace 2.8 mm long, 2.5 wide. First femur, 2.7 mm; patella and tibia, 3.3; metatarsus, 2.0; tarsus, 0.8. Second patella and tibia, 3.2 mm; third, 2.0; fourth, 3.0

Male. Total length 6.1 mm. Carapace 4.1 mm long, 3.4 wide. First femur, 3.8 mm; patella and tibia, 4.7; metatarsus, 2.3; tarsus, 0.9. Second patella and tibia, 4.0 mm; third, 2.7; fourth, 3.7.

*Variation.* The abdomen is quite variable in shape (Figs. 93–95). Females vary total length 5.2 to 9.4 mm, carapace 2.8 to 3.5 long, 2.2 to 3.0 wide. Males vary total length 5.4 to 7.2 mm, carapace 3.5 to 4.0 long, 3.0 to 3.7 wide.

*Diagnosis.* Females differ from *W. georgia* and *W. globosa* by having the openings of the epigynum lateral (Figs. 89–91) rather than posterior. Males have the width of the distal prong of the E-shaped terminal apophysis one-third to one-half the height of the whole structure (Fig. 96), its width is less than one-quarter the height in *W. globosa* and *W. georgia*.

*Natural history.* This is the most common species. Perhaps half the specimens in collections come from wasp nests (*Trypoxylon* sp.), some came from sweeping mesic to bottomland woods; another one was found on a fence, "mimicking bud on



Figures 88-100. *Wixia ectypa* (Walckenaer). 88-91. Epigynum. 88. Ventral. 89. Posterior. 90. Lateral. 91. Posterior, cleared. 92. Female, eye region and chelicerae. 93-95. Female abdomen, posterior. 93. (Florida). 94, 95. (Georgia). 96-100. Left male palpus. 96. Mesal. 97. Ventral. 98-100. Expanded. 98. Mesal. 99. Subventral. 100. Embolus, dorsal.

**Abbreviations.** a, terminal apophysis; c, conductor; e, embolus; h, hematodocha; m, median apophysis; pm, para-median apophysis; p, paracymbium; t, tegulum; y, cymbium.

**Scale lines.** 0.1 mm; Figs. 92-95, 1 mm.

cedar twig" (*Chamaecyparis* sp.); one was found "on house." Mature females have been collected from July to November, males from September to December.

*Distribution.* Massachusetts, Missouri, to Florida. The northernmost locality is Woods Hole, Massachusetts, but the specimens are juvenile and could be another species (Map 5).

*Wixia georgia* n. sp.

Figures 101–109, 111, 114, 124, Map 5

*Type.* Male holotype from a wasp trap, 8 June 1969, Athens, Clarke Col., Georgia (R. and J. Matthews) in the Museum of Comparative Zoology. The specific name is a noun in apposition after the state of the type locality.

*Description.* Female from Georgia. Posterior median eyes 1.2 diameters of anterior medians; anterior laterals 0.6 posterior laterals 0.7 diameters. The lateral eyes are slightly separated from each other. Anterior median eyes two diameters apart, posterior medians one diameter. Total length 6.5 mm. Carapace 3.5 mm long, 3.0 wide. Abdomen 5.3 mm long. First femur, 2.9 mm; patella and tibia, 3.5; metatarsus, 2.3; tarsus, 0.9. Second patella and tibia, 3.4 mm; third, 2.2; fourth, 3.5.

Male holotype. Posterior median eyes same diameter as anterior medians; laterals 0.5 diameter. Anterior median eyes 1.6 diameters apart, posterior median eyes two diameters apart. The laterals are slightly separated. The height of the clypeus is 1.5 diameters of the anterior median eye. Each third and fourth coxa and trochanter has a single ventral macroseta, a large one on the fourth, a small one on the third (Fig. 124). The first femur has a distal row of ventral macrosetae, the second and fourth a complete ventral row of macrosetae. The second tibia is swollen (Fig. 111). Total length 5.3 mm. Carapace 2.9 mm long, 2.4 wide. First femur, 2.9 mm; patella and tibia, 3.5; metatarsus, 1.9; tarsus, 0.9. Second patella and tibia, 2.9 mm; third, 1.7; fourth, 2.8.

*Variation.* The abdomen is variable in shape. Total length of females 5.8 to 7.3 mm; carapace 3.0 to 3.5 long, 2.3 to 3.0 wide. Total length of males 4.0 to 6.0 mm; carapace 2.6 to 3.0 long, 1.9 to 2.4 wide.

*Diagnosis.* *Wixia georgia* female differs from that of *W. globosa* in having the area behind the posterior lip of the epigynum swollen (Figs. 102, 103), from that of *W. ectypa* by having the openings on the posterior face (Fig. 102) rather than on the sides. The male differs from that of *W. ectypa* by having the distal prong of the E-shaped terminal apophysis thinner, from that of *W. globosa* by having the middle prong longer and thinner and the embolus a different shape (Figs. 108, 114).

*Natural history.* Most specimens come from wasp collections. Mature females have been collected from May to August, males from May to June.

*Distribution.* From New Jersey to Louisiana and Florida (Map 5).

*Wixia globosa* F.P.-Cambridge  
Figures 112, 115–122, 125, Map 5

*Amaura clivosa* O. P.-Cambridge, 1898, *Biologia Centrali Americana*, 1: 270, pl. 36, fig. 2, ♂. Male paralectotypes, not female lectotype, here designated. Female lectotype is *W. rufa*.

*Wixia clivosa*.—F. P.-Cambridge, 1904, *Biologia Centrali Americana*, 2: 485, pl. 46, fig. 2, ♂ (not fig. 3, ♀).

*Wixia globosa* F. P.-Cambridge, 1904, *Biologia Centrali-Americana, Araneidea*, 2: 486, pl. 46, fig. 4, ♀. Female holotype from Tepetlapa, [Oaxaca], Mexico in the British Museum, Natural History, examined.

*Wixia bryanti* Archer, 1951, *Amer. Mus. Novitates*, no. 1487: 16, fig. 33, ♀. Female holotype from White House Canyon, Santa Rita Mts., Arizona, in the American Museum of Natural History, examined. NEW SYNONYMY.

*Description.* Female. Total length 5.8 mm. Carapace 2.5 mm long, 2.3 wide. First femur, 2.3 mm; patella and tibia, 3.0; metatarsus, 1.9; tarsus, 0.7. Second patella and tibia, 2.9 mm; third, 1.7; fourth, 2.8.

Male. Total length 5.0 mm. Carapace 3.7 mm long, 2.5 mm wide. First femur, 2.9 mm; patella and tibia, 3.6; metatarsus,





Figures 101-109. *Wixia georgia* n. sp. 101-104. Epigynum. 101. Ventral. 102. Posterior. 103. Lateral. 104. Posterior, cleared. 105. Female. 106. Female abdomen, posterior. 107. Female, lateral. 108-109. Male left palpus. 108. Mesal. 109. Ventral.

Figures 110-112. *Wixia*, male second left patella and tibia. 110. *W. ectypa*, anterior. 111. *W. georgia*, posterior. 112. *W. globosa*, posterior.

Scale lines. 0.1 mm, except Figs. 105-107, 110-112, 1 mm.

1.9; tarsus, 0.8. Second patella and tibia, 2.7 mm; third, 1.9; fourth, 2.9.

*Variation.* Females vary in total length 3.7 to 6.3 mm, carapace 2.5 to 3.2 long, 2.2 to 2.4 wide.

*Diagnosis.* The transverse groove behind the posterior lip of the epigynum separates females from *W. georgia* (Figs. 117–118). The transverse groove is much shallower than the one of *W. subrufa* F. P.-Cambridge of Guatemala. The shape of the terminal apophysis and embolus (Figs. 115, 121) separates males from *W. georgia*.

*Natural history.* Mature females have been found from August to October, a mature male was collected in October. There are no habitat observations.

*Distribution.* Kansas, Arizona south to southern Mexico (Map 5).

### *Scoloderus* Simon

*Scoloderus* Simon, 1887, Ann. Soc. Entomol. France, ser. 6, 7: CLXXXVII. Type species by original designation *Hypophthalmia cordata* Taczanowski. The name is masculine.

*Diagnosis.* *Scoloderus* is close to *Wixia* but differs in the high, bulging carapace (Figs. 126, 127), and from many other genera in the high abdomen attached to the cephalothorax at an angle (Fig. 127). Unlike *Mangora*, which has the abdomen similarly attached, *Scoloderus* has no trichobothria anteriorly on the third tibia.

*Genitalia.* The epigynum is a plate with a posterior lobe (Fig. 129) and openings on the posterior face (Fig. 130); a blind internal sac perhaps has a coiled lumen (Fig. 131). The palpus has a conductor (c in Fig. 136), a large, broad median apophysis (m), and an embolus (e) with several lobes, one of which may be the terminal apophysis. *Scoloderus* lacks the paramedian apophysis seen in the related *Wixia*.

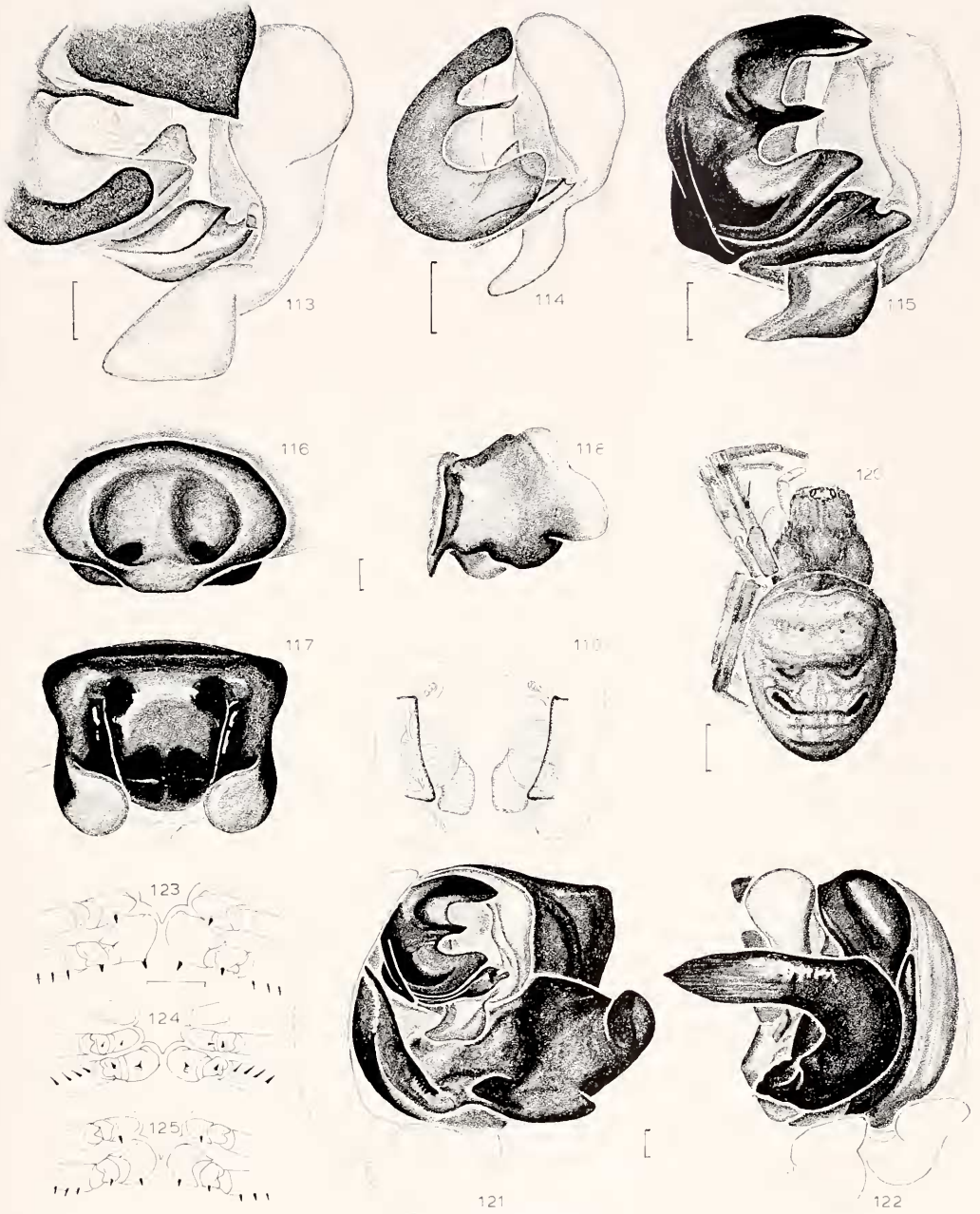
*Description.* Specimens of the two species differ greatly in degree of sclerotization and shape of abdomen. The carapace bulges in the thoracic region even in juveniles. The clypeus is about two times the diameter of the anterior median eyes (Fig. 126). The



Map 6. Distribution of *Scoloderus cordatus* (Taczanowski).

abdomen is attached at a right angle and is thus higher than long (Fig. 127). If weakly sclerotized the abdomen has dorsal humps (Fig. 128); if more heavily sclerotized, it is heart-shaped. The male is smaller than the female, its carapace as in the female, its abdomen almost lacking humps (Fig. 132). Palpal femur lacks basal tooth, patella has one weak macroseta. The first coxa has a hook on the distal margin, and the second tibia is swollen and has macrosetae (Fig. 133).

*Species.* There are two widespread similar American species, *S. cordatus* and *S. tuberculifer*. The genus is not known from other parts of the world. The numerous names in catalogs all refer to these two



Figures 113-115. *Wixia embolus*, terminal apophysis and conductor. 113. *W. ectypa*. 114. *W. georgia*. 115. *W. globosa*.

Figures 116-122. *Wixia globosa* F.P.-Cambridge. 116-119. Epigynum. 116. Ventral. 117. Posterior. 118. Lateral. 119. Posterior, cleared. 120. Female. 121, 122. Left male palpus. 121. Mesal. 122. Ventral.

Figures 123-125. *Wixia*, fourth coxa and trochanter. 123. *W. ectypa*. 124. *W. georgia*. 125. *W. globosa*.

Scale lines. 0.1 mm except Fig. 120, 1 mm.

species. The variable shape of the abdomen and degree of sclerotization has led describers astray.

*Scoloderus cordatus* (Taczanowski)

Plate 6, Figures 126–136, Map 6

*Hypophthalma* ? *cordata* Taczanowski, 1879, Horae Soc. Entomol. Rossicae, 15: 129, pl. 2, fig. 40, ♀. Female lectotype here designated, from Amable María [Taruma Prov., Dept. Junín], Peru in the Polish Academy of Sciences, examined.

*Hypophthalma* ? *eresimorpha* Taczanowski, 1879, Horae Soc. Entomol. Rossicae, 15: 130, pl. 2, fig. 41, ♂. Juvenile male holotype from Amable María [Taruma Prov., Dept. Junín], Peru, in the Polish Academy of Sciences, examined. NEW SYNONYMY.

*Scoloderus cordatus*,—Simon, 1887, Ann. Soc. Entomol. France, ser., 6, 7: CLXXXVII.

*Carepalxis tuberculifer*,—McCook, 1893, American Spiders, 3: 207, pl. 3, fig. 6, ♀. Not *S. tuberculifer*.

*Carepalxis nigriceps* O. P.-Cambridge, 1895, Biologia Centrali-Americana, Araneidea, 1: 158, pl. 19, fig. 9, ♀. Female holotype from Teapa, Mexico in the British Museum, Natural History, examined. NEW SYNONYMY.

*Scoloderus gibber* O. P.-Cambridge, 1898, Biologia Centrali-Americana, 1: 282, pl. 36, fig. 4, ♀. Female holotype from Atoyac, Veracruz, Mexico in the British Museum, Natural History, examined. F. P.-Cambridge, 1904, op. cit., 2: 521, pl. 51, fig. 8, ♀. Roewer, 1942, Katalog der Araneae, 1: 872. NEW SYNONYMY.

*Scoloderus nigriceps*,—F. P.-Cambridge, 1904, Biologia Centrali-Americana, Araneidea, 2: 521, pl. 51, fig. 7, ♀.

*Scoloderus tuberculifer*,—Comstock, 1912, Spider Book, p. 447, fig. 456, ♀. Comstock, 1940, Spider Book, rev. ed., p. 461, fig. 456, ♀. Not *S. tuberculifer* (O. P.-Cambridge).

*Scoloderus birabeni* Mello-Leitão, 1945, Rev. Mus. La Plata, nueva serie, secc. zool., 4: 242. Female holotype from Puerto Victoria, Misiones Province, Argentina in the Museum of La Plata, examined. NEW SYNONYMY.

*Scoloderus intermedius* Pikelin and Schiapelli, 1948, Comun. Mus. Argentino Cienc. Natur., ser. zool., 4: 13, figs. 14–17, ♀. Female holotype from Santa María, Misiones Province, Argentina in the Museo Argentino de Ciencias Naturales. NEW SYNONYMY.

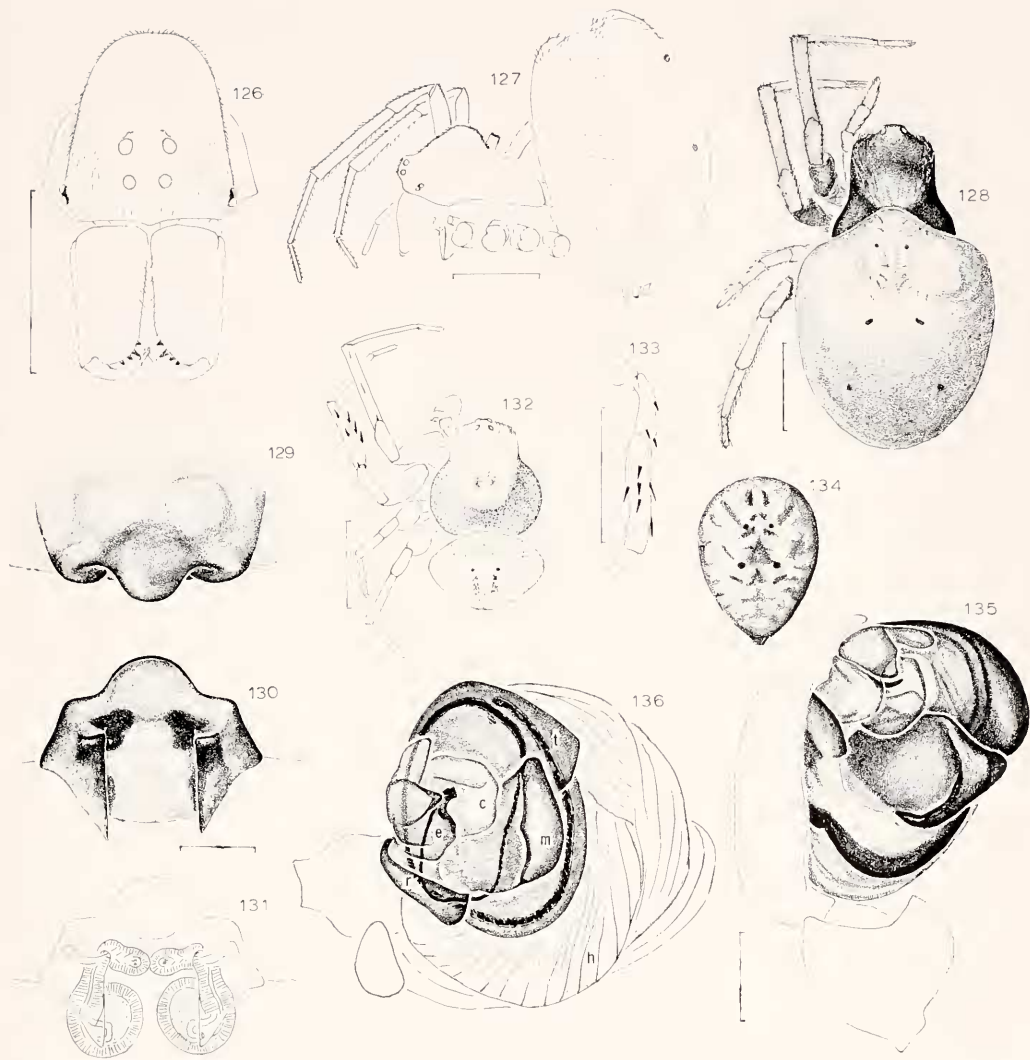
*Note.* Specimens in collections have been labeled *Wixia* sp., *Wixia ectypa*, some as *Scoloderus* sp. and *Scoloderus tuberculifer*.

*Description* of female from Florida. Carapace dark brown with paired black patches on anterior slope. Chelicerae brown, darker distally. Sternum brown, coxae light brown. Legs brown, distal articles lighter. Dorsum of abdomen whitish, sometimes with transverse black bars. Center of venter without pigment. Posterior median eyes 1.3 diameters of anterior medians, laterals 0.8; anterior medians 1.4 diameters apart, posterior medians 1.5. The anterior margin of the chelicerae has four teeth, the third from distal end largest; posterior margin has three teeth, the third from distal end largest. Total length 3.7 mm. Carapace 1.5 mm long, 1.3 wide. First femur, 1.9 mm; patella and tibia, 1.8; metatarsus, 0.9; tarsus, 0.4. Second patella and tibia, 1.5 mm; third, 1.0; fourth, 1.2.

Male. Much darker than female, thoracic area and sides darker and more dark marks on posterior of abdomen. Anterior median eyes slightly larger than in female, separated by about same distances. Total length 2.4 mm. Carapace 1.3 mm long, 1.2 wide. First femur, 1.7 mm; patella and tibia, 1.7; metatarsus, 0.9; tarsus, 0.5. Second patella and tibia, 1.3 mm; third, 0.8; fourth, 1.0.

*Variation.* Abdomen usually has two dorsal humps and one smaller median hump more anterior. Humps rarely subdivided. Abdomen variable in shape and in some more sclerotized South American specimens, abdomen lacks humps and is shield-shaped. Females north of Mexico vary in total length from 3.2 to 4.3 mm, carapace 1.5 to 2.0 long, 1.3 to 1.7 wide. Males, total length 2.3 to 2.8 mm, carapace 1.4 to 1.5 long, 1.2 to 1.4 wide.

*Diagnosis.* The epigynum of *S. cordatus* has a semicircular posterior lobe (Fig. 129); that of *S. tuberculifer* has a narrow lobe with parallel sides. In cleared preparations the connecting duct of *S. cordatus* appears straight (Fig. 131), that of *S. tuberculifer* has a posterior loop. The palpus of *S. cordatus* has a median apophysis with a narrow distal rim (Fig. 135); in *S. tuberculifer* the rim is half the



Figures 126–136. *Scoloderus cordatus* (Taczanowski). 126–131. Female. 126. Eye region and chelicerae. 127. Lateral. 128. Dorsal. 129–131. Epigynum. 129. Ventral. 130. Posterior. 131. Posterior, cleared. 132–136. Male. 132. Dorsal. 133. Left second leg, anterior. 134. Abdomen, dorsal. 135. Left palpus, mesal. 136. Palpus, expanded.

**Abbreviations.** c, conductor; e, embolus; m, median apophysis; r, radix; t, tegulum.

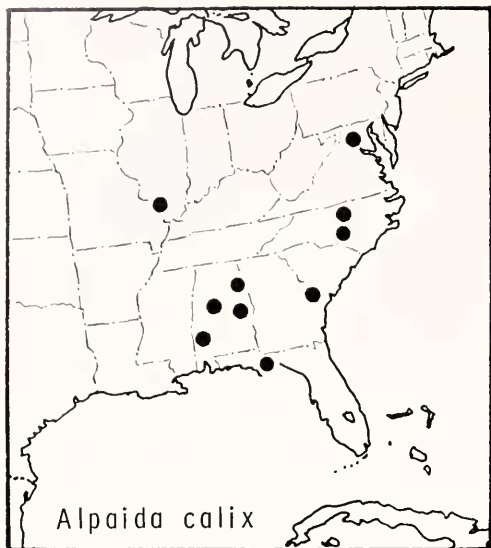
**Scale lines.** 0.1 mm, except Figs. 126–128, 132–133, 1.0 mm.

length of the median apophysis. In the two species the sclerites around the embolus differ in shape.

**Natural history.** Females have been collected in woods all year, males in March, April, September and December in Florida.

Only the web of *S. tuberculifer* is known, first found by W. Eberhard in Colombia<sup>1</sup>

<sup>1</sup> See also W. G. Eberhard, 1975, *J. Natur. Hist.*, **9**: 93–106. Mark Stowe found the web of *S. cordatus* in Florida on palmettoes in July 1975. It was 40 cm long.



Map 7. Distribution of *Alpaida calix* (Walckenaer).

(Plate 6). It is unique, a similar but upside-down version of the web illustrated by Robinson (1972) of an unknown New Guinea Metinae.

*Distribution.* From southern Georgia to Texas, south to northern Argentina (Map 6).

### *Alpaida* O.P.-Cambridge

*Alpaida* O. P.-Cambridge, 1889, *Biologia Centrali-Americana, Araneida*, 1: 52. Type species by monotypy *A. couica*. The name is feminine.

*Parepeira* Mello-Leitão, 1933, *Arch. Esenela Sup. Agric. Med. Veter.*, 10(1): 3-63 (not seen). Type species *Epeira albostrigata* Keyserling. NEW SYNONYMY.

*Subaraneus* di Caporiacco, 1945, *Proc. Zool. Soc. London*, 118: 661. Type species by original designation *Epeira veniliae* Keyserling. NEW SYNONYMY.

*Lariniacantha* Archer, 1951, *Amer. Mus. Novitates*, no. 1487: 15. Type species *Epeira grayii* Blackwall, 1863 by original designation. NEW SYNONYMY.

*Subedrius* di Caporiacco, 1954, *Comment. Pontificia Acad. Scient.*, 16: 84. Type species *Epeira nigropostulatus* O. P.-Cambridge by original designation. NEW SYNONYMY.

*Note.* This genus includes the majority of South and Central American species described in *Epeira*, *Aranca*, *Araneus* and

*Singa*. Mello-Leitão placed species belonging to this genus in *Wixia* in the 1940's, Archer in *Lariniacantha*.

*Diagnosis.* *Alpaida* differs from *Araneus* and *Singa* by the genitalia. The epigynum is a broad lobe without a scape (Figs. 140, 141). Unlike the palpi of *Singa* and *Hypso-singa*, the palpus in *Alpaida* has the tegulum lateral, the sclerites facing mesally (Fig. 143). There is a terminal apophysis (a in Fig. 144), generally with two, usually heavily sclerotized lobes, one of which may be the subterminal apophysis. The median apophysis (m) is bulky, variously shaped, and also heavily sclerotized. *Alpaida* lacks the paramedian apophysis seen in *Eriophora*, *Verrucosa* and *Wixia*. Species are most easily assigned to the genus on the bases of the characteristic epigynum and the shape and color of the abdomen.

*Coloration.* Carapace, sternum yellow-white to brown. Legs usually not banded. Eyes often on black spots. The abdomen is often brightly marked, frequently with longitudinal bands.

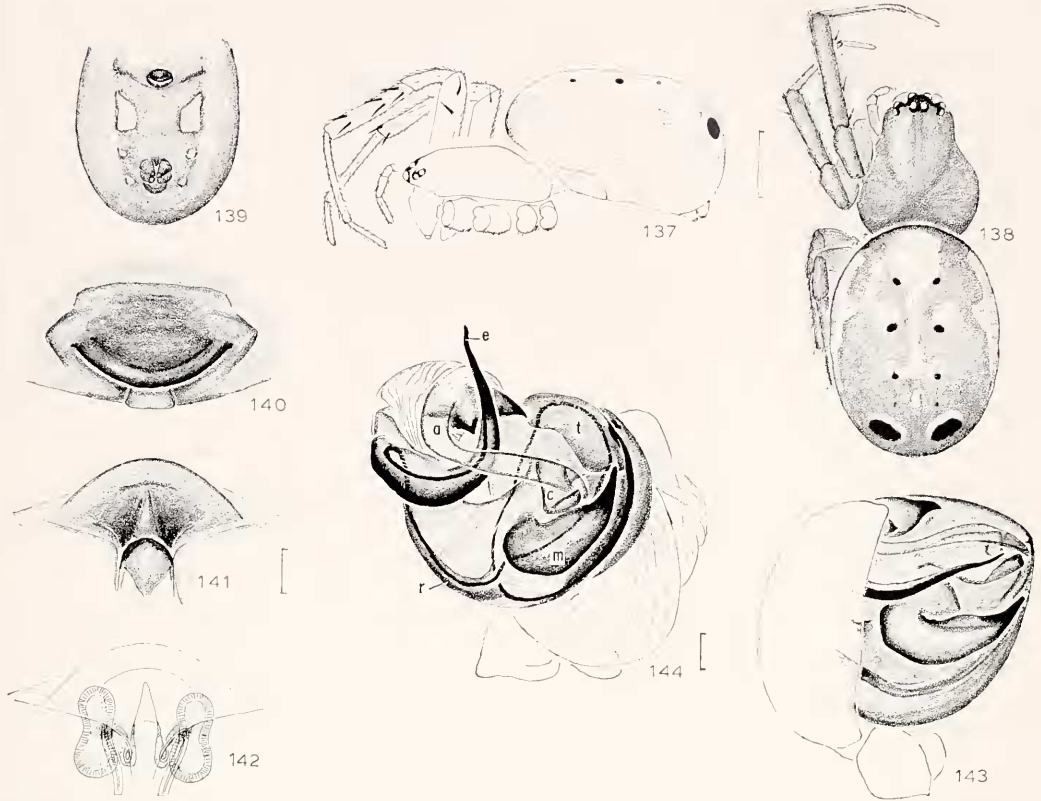
*Structure.* The carapace is smooth, without setae, wider than eyes in eye region of female. The lateral eyes are distant from the medians. The abdomen generally is shield-shaped, usually widest anteriorly; sometimes widest posteriorly and truncate. There may be sclerotized spines at the anterior end of the abdomen; sometimes the muscle scars are sclerotized, but there are few setae.

*Species.* *Alpaida* is known only from tropical America; a few species, including *A. calix*, extend into the temperate zone. There may be 50 to 100 species. *Alpaida calix* is not a characteristic member of the genus, its placement is in doubt and may eventually have to be changed.

### *Alpaida calix* (Walckenaer), new combination

Figures 137-144, Map 7

*Epeira calix* Walckenaer, 1841, *Histoire Naturelle Insectes Aptères*, 2: 90. The types are Abbot manuscript illustrations, no. 249, 250 from Georgia in the British Museum, Natural History;



Figures 137-144. *Alpaida calix* (Walckenaer). 137-142. Female. 137. Lateral. 138. Dorsal. 139. Abdomen, ventral. 140-142. Epigynum. 140. Ventral. 141. Posterior. 142. Posterior, cleared. 143-144. Left male palpus. 143. Mesal. 144. Expanded, submesal.

Abbreviations. a, terminal apophysis; c, conductor; e, embolus; m, median apophysis; r, radix; t, tegulum.

Scale lines. 0.1 mm, except Figs. 137-139, 1.0 mm.

Copies of the manuscript in the Museum of Comparative Zoology, examined.

*Epeira maura* Hentz, 1847, J. Boston Soc. Natur. Hist., 5: 474, pl. 31, fig. 8, ♀. Female holotype from Alabama in the Boston Natural History Society, destroyed.

*Singa maura*. - Keyserling, 1884, Verhandl. Zool. Bot. Gesell. Wien, 34: 527, pl. 13, fig. 26, ♀. Keyserling, 1893, Spinnen Amerikas, 4: 283, pl. 14, fig. 208, ♀. McCook, 1893, American Spiders, 3: 234, pl. 19, fig. 8, ♀. Roewer, 1942, Katalog der Araneae, 1: 878.

*Leucauge maura*. - F. P.-Cambridge, 1903, Biologia Centrali-Americana, Araneidea, 2: 443.

*Araneus maurus*. - Bonnet, 1955, Bibliographia Araneorum, 2: 542.

Note. The name *maura* was first synonymized with *calix* by Chamberlin and Ivie (1944).

Description. Female. Carapace, sternum and legs orange-brown, eye area blackish. Abdomen has dorsal white marks, two black spots posteriorly surrounded by white (Fig. 138). The venter has two white longitudinal marks on each side of median dark area. Anterior median eyes largest, secondary eyes 0.8 diameter of anterior medians. Anterior median eyes one diameter apart, one diameter from laterals. Posterior medians their radius apart, two diameters from laterals. The height of the clypeus is less than the radius of the anterior median eyes. The anterior margin of the chelicerae has four teeth, the posterior row three. Legs are strong, short,

with few macrosetae. Abdomen is oval. Total length 6 mm. Carapace 2.3 mm long, 1.8 wide. First femur, 2.0 mm; patella and tibia, 2.5; metatarsus, 1.5; tarsus, 0.8. Second patella and tibia, 2.2 mm; third, 1.2; fourth, 1.7.

Male. Coloration like that of female, but white marks on dorsum less distinct. Carapace is narrower, a slight thoracic depression with a longitudinal line. Secondary eyes are equal to the radius of the anterior median eyes. Eye spacing as in female. The first coxa has a hook on distal margin, the first and second legs have many macrosetae, but are not otherwise modified. Total length 4.0 mm. Carapace 2.3 long, 1.8 wide. First femur, 2.0 mm; patella and tibia, 2.6; metatarsus, 2.0; tarsus, 0.9. Second patella and tibia, 2.3 mm; third, 1.3; fourth, 2.0.

*Variation.* This species is thought to be deep crimson or sepia except for the light patches when alive. Total length of female is 3.9 to 6 mm, carapace width 1.6 to 1.9. Total length of males is 3.8 to 4.0 mm, carapace width 1.7 to 1.8.

*Diagnosis.* The oval abdomen with two posterior spots (Fig. 138) separates *A. calix* from other *Alpaida*. Unlike other *Alpaida* the abdomen is oval rather than elongate and the eyes are spaced more closely. There is a slight doubt on the placement of this species. Perhaps the species belongs to *Bertrana* or another *Alpaida* related genus.

*Natural history.* *Alpaida calix* has been collected by sweeping bottomland pine and hardwood and in hardwood forest in North Carolina. Males seem to be mature in spring, females until September.

*Distribution.* From Washington, D.C. and southern Illinois to Alabama and northern Florida (Map 7).

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